DECEMBER 25, 1961

# American Machinist / Metalworking Manufacturing

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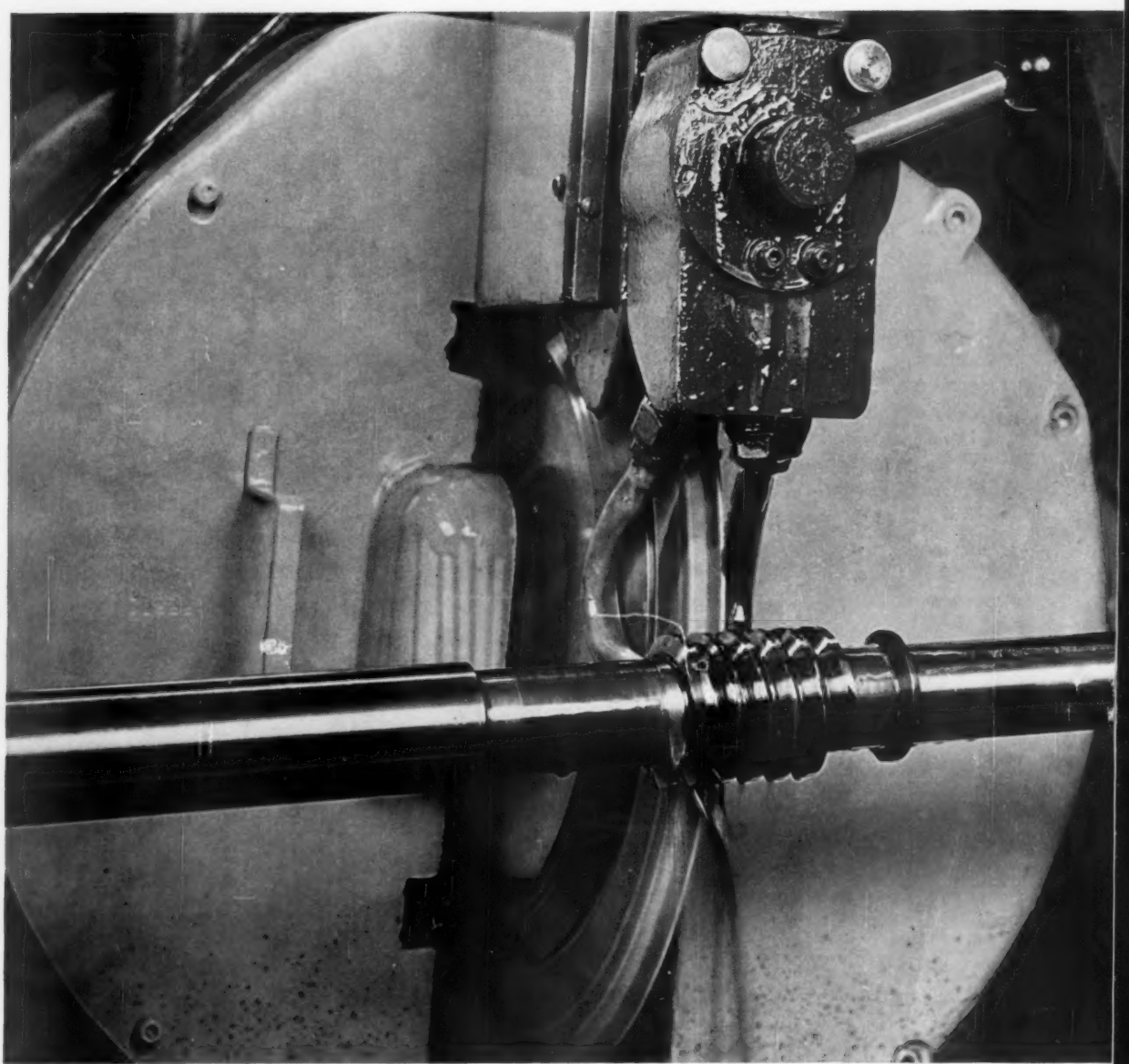

Grinding a worm for a gear hobber on a thread mill—see page 1

**Constant Cutting Speed** page 57

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**Arc Spotwelding at Work** page 67

# REJUVENATING RED-HEADS

## How to make an old Boringhead or Wheelhead Good as New

by Arthur Walsh
*Manager, Parts Sales*
*The Heald Machine Company*

There's only *one* way to make an old Red-Head good as new. Return it to its maker!

This statement is neither facetious nor exaggerated. Let's look at the facts.

A precision machine tool spindle, although basically simple in design, is one of the most carefully engineered and meticulously manufactured components of the entire machine. This is particularly true of Heald Red-Head Boringheads and Wheelheads. It has to be that way, for on the *spindle* depends the performance of the machine and the reputation of the Company.

When a Red-Head Wheelhead or Boringhead needs reconditioning, and you want it restored to original Red-Head precision, ship it back to us here in Worcester. For nobody knows as much about a product as the company which made it. And certainly no one else has so much at stake on its performance!

When a head comes back here we give it the full Red-Head treatment. This includes as *much* or as *little* as needs to be done to make it as good as new. Any or all of the following items may be replaced or reworked, depending on their condition – body, spindle, caps, slingers, pulleys, spacers, spring cages, bearings and miscellaneous parts. Only the finest Ultra-precision bearings made to Heald specifications are used – precision matched for exactly the right internal clearances, fits and preloads.

After final inspection and reassembly, every rebuilt Red-Head is run continuously on the test jack for eight hours to check for temperature rise, noise level and vibration. A head that passes all of our inspections and tests is in every respect as good as new.

The cost depends on the amount of work done and the parts reworked or replaced. But in all cases you get a head that carries the original Heald guarantee, at far less than the cost of a new head.

Several of our customers have adopted a policy of regularly-scheduled head rebuilding on a preventive-maintenance basis. This has worked out very well, as it keeps the amount of repairs to the minimum, assures fast return of the rebuilt heads and substantially reduces rebuilding costs.

It pays to come to Heald for all your Red-Head repairs.

Anti-Friction bearings for Heald Red-Heads are carefully selected and thoroughly inspected before assembly into any Red-Head – the same rigid specifications must be met for bearings to be used in either **new** or **rebuilt** heads.

*It Pays to come to Heald*

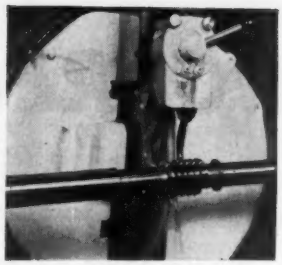
THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
**Worcester 6, Massachusetts**

**CIRCLE 251 READER SERVICE CARD**

COVER:

*Finish grinding a worm of 8620 steel, case hardened to Rh 58-63C on a Jones & Lamson thread grinder at Norton. The wheel is a 20 in. 32A-80-I8-VBE.*



**American Machinist** / *Metalworking Manufacturing*

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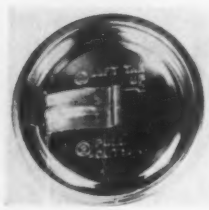
TURN PAGE FOR METALWORKING REPORT ——►

# METALWORKING REPORT

***. . . what's new and significant in manufacturing techniques and materials—direct from our own staff and round-the-world news bureaus***

**FORMING . . . Progressive dies larger than heretofore considered economical are being used by important auto plants.** They are used in straight-side presses designed for off-center loading by the Minster Machine Co (Minster, Ohio). Large progressive dies on multi-operation jobs—even short runs—are **more economical than handling loose pieces from station to station** by mechanical fingers or other transfer mechanisms.

**INSPECTION . . . Three significant surface-geometry parameters,** as well as average microfinish, **can now be recorded simultaneously** with a new Surface Analyzer system from Brush Instruments (Cleveland). **The MS-5000 records (1) roughness, (2) waviness, and (3) total surface texture, in addition to average microfinish** for almost any surface: metal, plastics, ceramics, glass, and organic coatings. Interference factors are eliminated since the Surfindicator (part of the system) is battery powered, probe drive contains no motor or gears to introduce vibration.



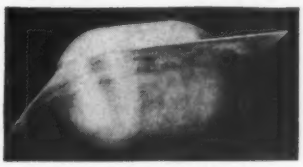
**FORMING . . . Entire lid of this new Pulltop can is formed in one double-action stamping operation.** When tab is pulled, entire lid lifts off and simultaneously removes the aluminum foil layer which hermetically seals the can. The lids—which are **also available with a pre-formed, triangular pour-opening**—can be used on existing can-making lines, and are produced on a machine invented by Can-Top Machinery Corp (Bala-Cynwyd, Pa). Details will be reported soon.

**FORGING . . . Flutes in twist drills are being roll forged** in Russian plants **to save about 40% of metal** normally required in taper-shank drills from 0.6 to 1.57-in. dia. For straight-shank drills, the **process consists of roll forging, twisting, and straightening.** It saves from 35 to 60% of the metal; cost in both cases is 25% less than for drills with milled flutes. Another method under development: **Extruding blanks through a special die with twist grooves,** giving a blank with pre-formed grooves.

**ASSEMBLY . . . Line of threaded fasteners—made from refractory metals for use at 2000 F and up**—is supplied by Standard Pressed Steel Co in 14 different alloys of the five refractory metals. A **new thread form eliminates previous problems in dimensional uniformity of protective coatings.** In published tests at 1800 to 2000 F, bolt tensile strengths ranged from 20,600 psi for pure columbium to 69,000 psi for arc-cast molybdenum—0.5% titanium. SPS is tooled for bolt diameter sizes No. 10 through ⅜ in.

**INSPECTION . . . Up to 200,000 dimensional variations a second can be measured to an accuracy of 10 millionths** with a new non-contact eddy-current device developed by Abilities Inc (Albertson, LI, NY) for GE's Small Aircraft Engine Dept. Full details on this device, which **measures rotor blades spinning at thousands of rpm,** start on p64.

**CUTTING . . . Electric discharge machining—using large, press-type tooling**—is solving many problems at Republic Aviation Corp (Farmingdale, LI, NY). Two examples: 1) A long titanium channel requires irregular contour cut on one side. Solution: **Brass "punch" on upper member of "die set" is lowered on workpiece** which is clamped or nested in lower member. 2) A double-curvature panel requires 450 holes. Solution: **450 spring-backed punches operate through upper hold-down,** which is guided by leader pins. This takes only a small fraction of time and cost of drilling. Details in an early issue.



**FORMING . . . Sheet metal is inflated much like a balloon to make hollow metal structures;** the material is a specially rolled sheet of aluminum which **has a core of lower melting point** than outer surfaces. In the process—patented by The Metal Specialty Co (Cincinnati) and The Stolle Corp (Sidney, Ohio)—the sheet is **placed between hot dies in a specially controlled hydraulic press,** the center core melts, and a hollow needle is inserted. Clean dry air, or inert gas, **forces the sheet's outer surfaces into** dies on the press. Method costs less than joining two halves because drawing, flanging, and welding are eliminated.

**WELDING . . . Welding processes can be shown to a class in full color** with Eutectovision, a system that gives a magnified image much like an opaque projector. With the device, developed by Eutectic Welding Alloys Corp (Flushing, NY) a welder works in a ventilated booth where an **optical system (probably with a large depth of field) picks up and projects an image of all operations.** The company, although it does not plan to market the system, has donated the first model to the Welding Research Council of the American Welding Society. They think it **should also be valuable as a research tool.**

**FINISHING . . . It takes only four men to chrome-plate 15,000 automotive parts per shift** in a midwestern job shop. At this high production rate, in which parts are handled individually, the **plated part comes off the line to finish tolerances,** eliminating the usual finish-grinding operation. The line installed at Sifco Metachemical, Inc (Cleveland) is deliberately kept semi-automatic, so that it **has job-shop flexibility.** Full details on the new line will appear in a forthcoming issue.

**WELDING . . . A new sewing-machine-like spot welder makes 2,000 overlapping welds a second to give stainless foil a gas-tight seam.** Welding electrodes on the prototype machine built by Maxim Controls Co (Portland, Ore) are **copper disks set in gangs of six or more that weld as they roll over the surface of the metal.** Once the control panel has been set for thickness and type of material, it **automatically feeds ultra-short welding pulses of correct intensity, duration, and speed rate.** This restricts the heat-affected zone to a minimum. Machine will make single spot or seam welds.

*Continued on next page*

## Coming in AM/MM

- *Save with preset boring tools*
- *Quick-change plating line*
- *Ground rules for stainless welds*

## METALWORKING REPORT . . .

**INSPECTION . . . Movable modular gage labs that control temperature to ± ¼ F and humidity to a maximum of 50%** are being installed by the Sheffield Corp (Dayton, Ohio) for a number of companies. The Modulabs, which also give dust control at filter of 0.5 micron, are **built from aluminum-clad Cotemp (controlled temperature) wall panels** 4 ft wide by 13 ft high, and 4-by-16-ft aluminum-sided polystyrene roof panels. **Draft-free conditioned air flows through thousands of tiny holes in ceiling,** returns through walls.

**CUTTING . . . An aluminum-oxide abrasive grain for grinding tough alloys** has been developed by Carborundum Co (Niagara Falls, NY) and is available in a full line of grinding wheels in grit sizes from 36 to 220, F to S grade, and 5, 8, and 12 structures. Known as PA grain, the **new abrasive combines sharpness and strength** and is formulated for toolroom applications. For more details see p62.

**MATERIALS . . . New X2020 lithium-aluminum has formability characteristics superior to that of other structural aluminum alloys,** reports John A Vaccari, senior research engineer at Republic Aviation Corp. In his recent fabricability study of Alcoa's new alloy, Vaccari also pointed out that **X2020's slow rate of natural aging minimizes distortion and eliminates refrigerating** solution heat-treated material before forming.

**CUTTING . . . Deep holes from 0.500 down to 0.072-in. dia can be drilled straight, round, and with a fine finish** by a precision high-speed spindle developed by Whitnon Mfg Co (Farmington, Conn). Designed for use on Heald, Ex-Cell-O, Jones & Lamson and similar boring machines, the spindle is equipped with a **rotary oil joint capable of vibration-free operation at speeds to 15,000 rpm** and oil pressures to 2800 psi.

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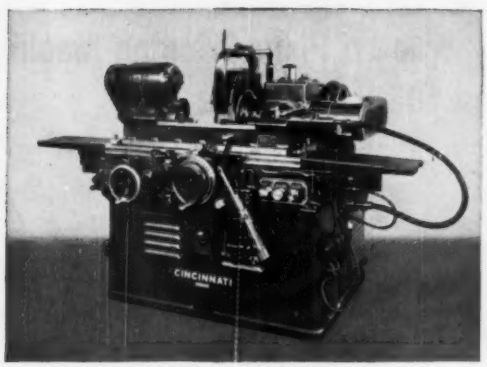
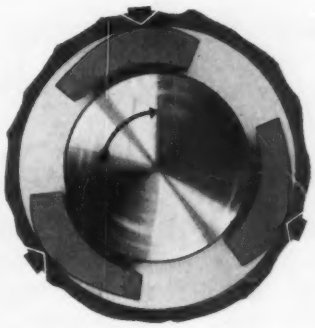
## Everything about this machine is obsolete except



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Filmatic bearings contradict just about everything we know about bearings and progress.

In the 23 years since we started building Filmatic-equipped grinding machines, major advancements have been made in every component (refer to next two pages). But we haven't been able to improve on the Filmatic bearings. Nor has anyone else.

Altogether, Cincinnati has built about 28,000 various types of grinding machines using these bearings. We can identify only 32 cases of failure. This is reliability of 99.9 per cent !

Filmatic bearings never need adjustment once they leave the factory. They perform equally well for rough or finish grinding. There is absolutely no wear.

There are two Filmatic bearing assemblies around the grinding wheel spindle, completely submerged in oil. Each assembly consists of shoes or segments which can rock slightly. Rotation of the spindle draws oil between the segments and spindle, forming a high pressure wedge-shaped oil film between each shoe and the spindle.

These high-pressure oil wedges lock the spindle on the one center of rotation regardless of direction or force of load. This constant center of rotation not only assures precision grinding results, but also makes possible heavier cuts, rapid metal removal, and quick "spark-out" during the grinding operation.

For a graphic presentation of the amazing Filmatic bearing, ask for Publication No. G-604. Grinding Machine Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

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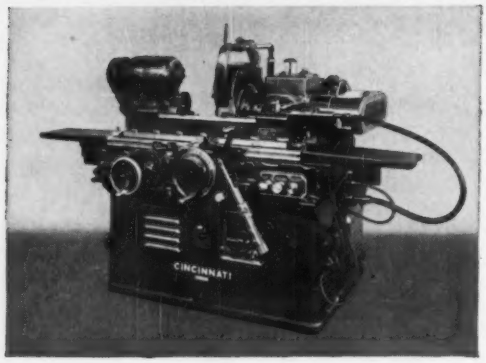


# NOTICE

## to owners of thousands of CINCINNATI Plain Grinding Machines built between 1936 and 1944:

Almost everything about your old CINCINNATI Plain Grinder is obsolete! If you've done a good job of maintenance, it may be just as good as the day you bought it. But that's no longer good enough!

Your machine is obsolete because our new 6"R and 10"L Plain Grinding Machines make available substantial increases in quality, accuracy, dependability—and important reductions in your costs.

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**OPERATOR EFFICIENCY.** Everything has been done to help the operator produce better work with less effort. He can push a button to initiate the grinding cycle and leave precision up to the machine.

**MANY MORE COST-REDUCING FEATURES.** Behind-the-wheel profile truing for lowest cost per piece when grinding tapers, steps and other shapes. Accurate wheelhead movement and easy-to-read dials make possible hand adjustment to fifty millionths. Infinitely variable table traverse. Dog-controlled table reciprocation from 3/32" to full stroke. Many more.

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If you care about costs and competition, you'll call in your Cincinnati representative right away. Remember, everything about your old CINCINNATI Plain Grinder is obsolete. Everything, that is, except its Filmatic bearings and its great reputation.

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THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

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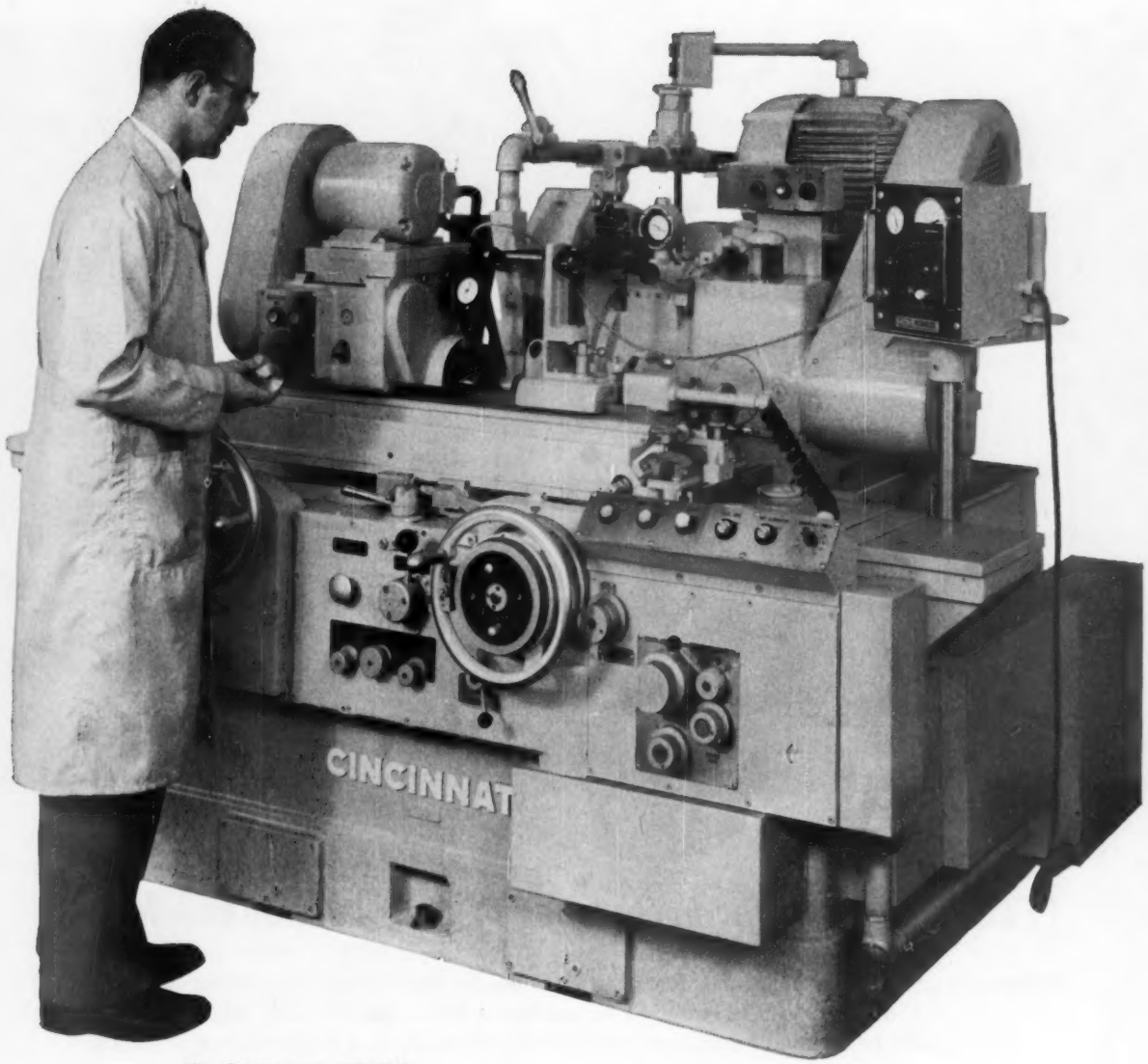


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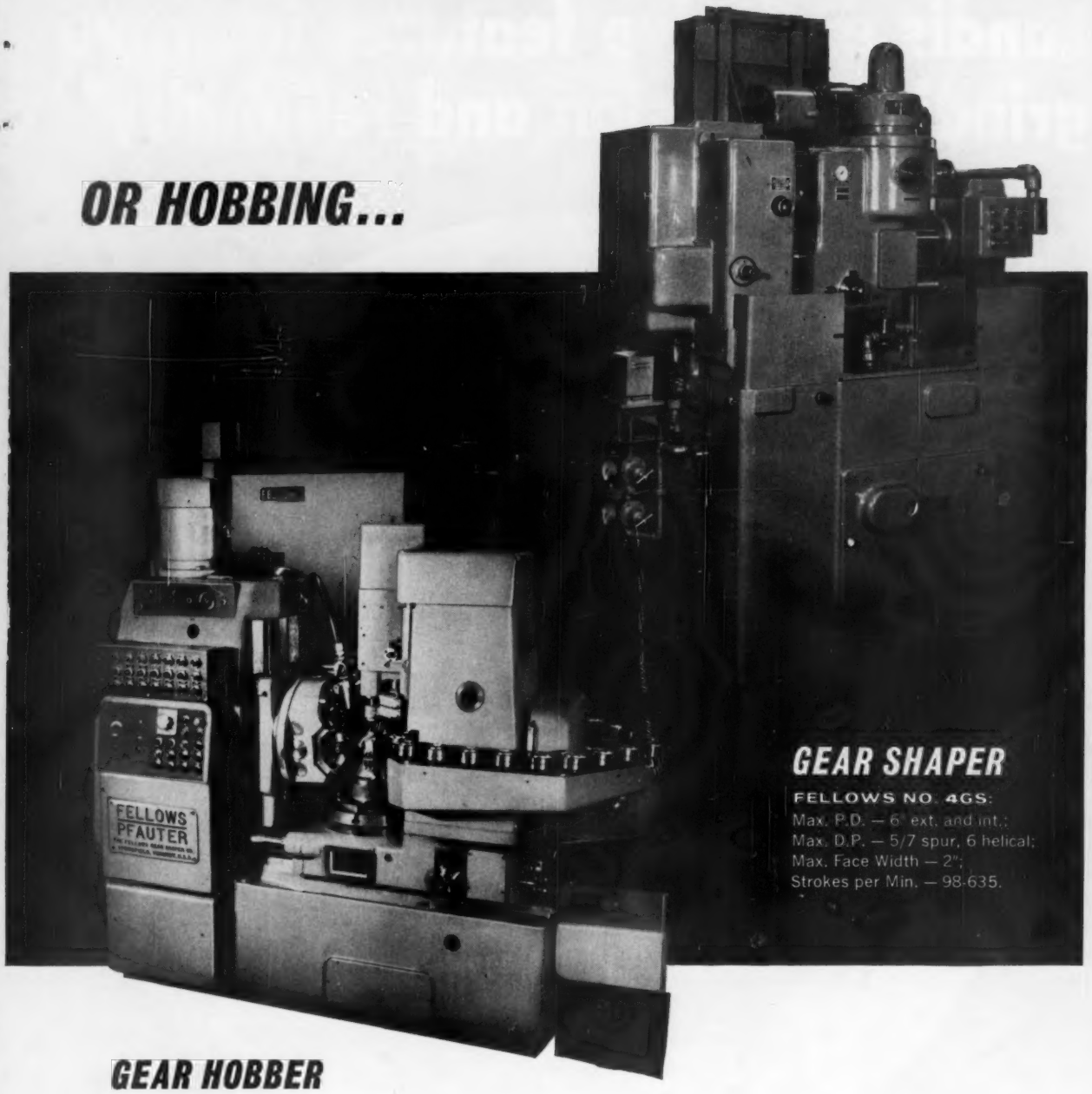
*Why not ask a Fellows Representative for complete details? All Fellows Offices are at your service.*

# OR HOBBING...




## GEAR SHAPER

**FELLOWS NO. 4GS:**

Max. P.D. — 6" ext. and int.;
Max. D.P. — 5/7 spur, 6 helical;
Max. Face Width — 2";
Strokes per Min. — 98-635.

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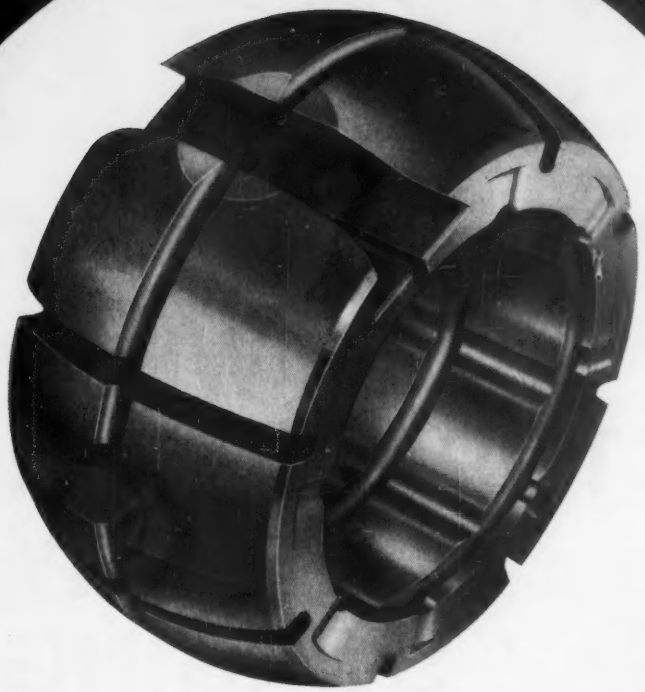

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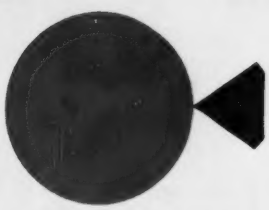
**Work support.** Exclusive wedge work rest and loaded ball spindle footstock give maximum rigidity to work parts.

**exclusive Landis features combined for lower cost and accuracy**

**Wheelfeed.** Exclusive Landis Microfeed® is a pulse feed in millionths to final size that meets closest tolerances on a production basis.



**Wheel dressing.** Exclusive Landis Truform dresser with ball slide, shake-free construction. Assures exact duplication of all wheel profiles.

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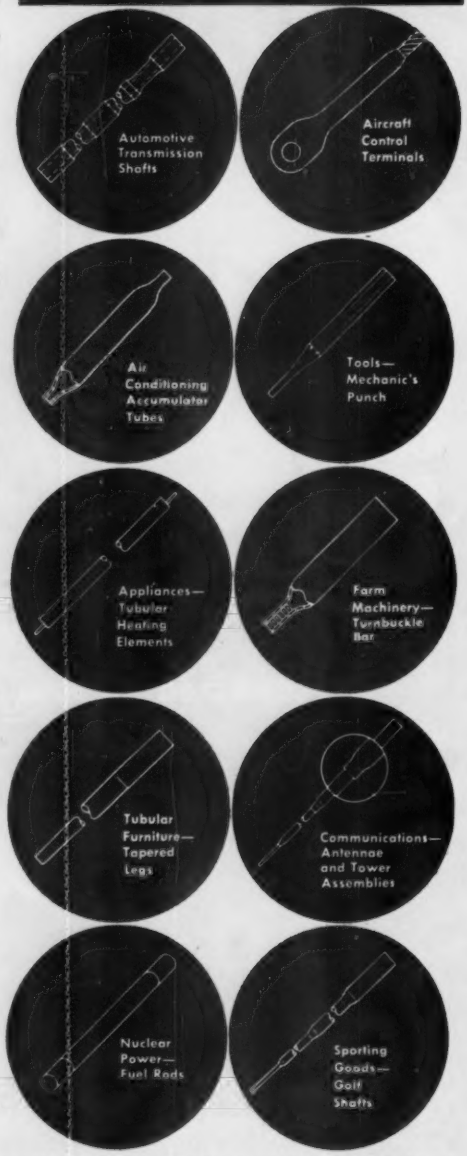
LANDIS TOOL COMPANY, WAYNESBORO, PA.

# WHAT TORRINGTON ROTARY SWAGING MACHINES CAN DO FOR YOU




These versatile, efficient machines shape metal parts by hammering between dies instead of cutting stock away. They give you a full pound of parts from every pound of metal. They also save you time and labor. Swaging is usually the fastest way to point, taper, reduce or bond metal parts. Tooling is simple and surprisingly inexpensive.

There is no greater authority on swaging than Torrington. Torrington pioneered the swaging process, designed the original equipment and has constantly improved it through innovations in methods and engineering. Today, Torrington operates more swaging machines than any other company in the world. The experience of our engineers is unparalleled. We maintain experimental shops to help you solve your special swaging problems. If you have a part that can be swaged we can design and produce "Job-Tested" dies to your specifications. Come to Torrington with your swaging problems—we have the answers. The Torrington Company, Swaging Machine Division, 200 North St., Torrington, Conn.

*progress through precision* **ROTARY SWAGING MACHINES**

**THE TORRINGTON COMPANY** Torrington, Conn.

# DISC GRINDS WIDE RANGE OF SPRINGS

Gardner 2V18-24" vertical double spindle grinder. Capacity: spring diameter ⅛" to 1¼"
spring length ¼" to 3"
wire diameter 0.030" to 0.140"

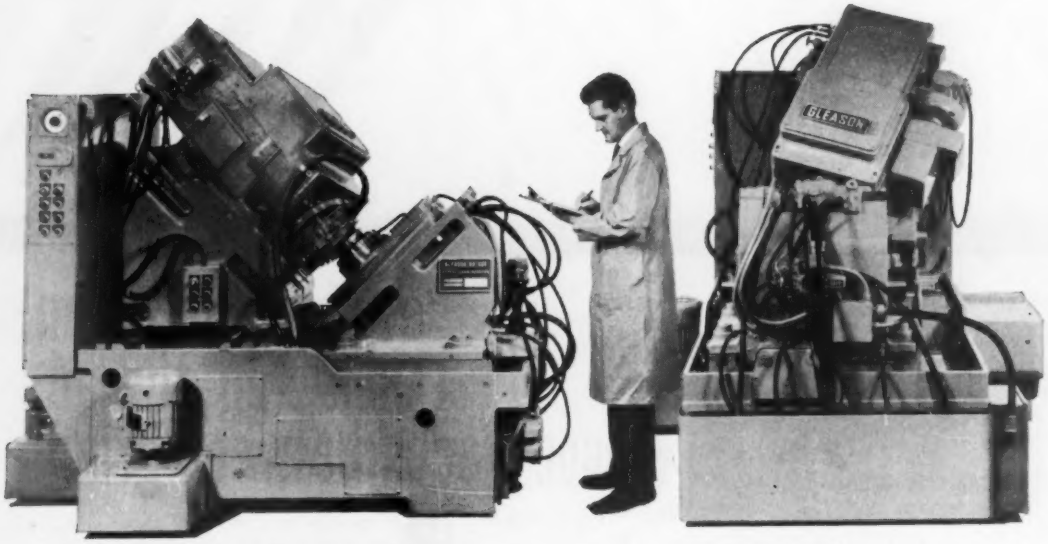
grinds **two** surfaces parallel in **one** operation

**GARDNER**

GARDNER MACHINE COMPANY, BELOIT, WISCONSIN

**...PRODUCES QUIET, ACCURATE GEARS, UP TO 50% FASTER...AND SAVES FLOOR SPACE.** These new Gleason "inclined-spindle" Hypoid Gear Cutting machines are primarily designed for faster, more accurate roughing and finishing of automotive main drive gears up to 10½" O.D. ■ Unique "inclined-spindle" design provides greater rigidity for precision cutting. ■ New type cutters, faster index and work clamp arrangements combine with automatic loaders to increase production up to 50%. ■ Yet, these new machines occupy 35% less floor space than previous machines. ■ Set-up and operation are simplified . . . only four summary settings with simple gage bars to relate work and cutter. Any number of machines can be set-up with the same gage bars to produce identical gears . . . no expensive set-up fixtures needed. ■ New magnetic chip removal and coolant systems assure constant forced flow of clean oil over the work . . . help prolong cutter life, eliminate periodic cleaning, and minimize coolant loss. ■ For information on these all-new machines write Gleason Works, 1000 University Avenue, Rochester 3, New York.

# A BRAND NEW ANGLE IN GEAR CUTTING . . .

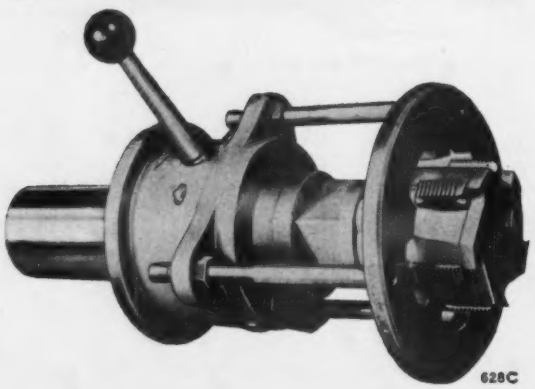



**NEW GLEASON No. 606** Hypoid Gear Rougher

**NEW GLEASON No. 607** Hypoid Helixform Gear Finisher

GLEASON

# even at 260 s.f.m.
# LANDIS tap threads
# 1600 pieces between grinds



628C

Another LANDIS Machine COMPANY customer is well satisfied. The Dixon Valve and Coupling Company, Philadelphia, Pennsylvania, reports that a Landis Tap threads 1600 suction nuts between grinds — and at a threading speed of 260 S.F.M.!

## thread specifications:

Equipment used: No. 4 ALT Collapsible Tap equipped with a 3½" Head, mounted on a Gisholt No. 3 Turret Lathe.

| | |
|---|---|
| Material: | Cast Brass |
| Diameter: | 3", 8 pitch, Straight Pipe |
| Thread Length: | ¾" |

The tap cuts a ¾" thread length up to ½" away from a shoulder having a ¼" undercut. Thus a small amount of internal machining room remains in the nut. As a result, Landis engineers recommended a cut brass grind on 30° throat chasers to take care of the material, shoulder and undercut problems. No guesswork prompted the decision. Landis has decades of experience in the manufacture and practical application of all types of taps.

ALT Collapsible Taps, such as used in this operation, are designed for tapping straight threads. They are available in five sizes to cover a tapping range of 1¼" to 13¼" and may be used as stationary or rotary applications. Their outstanding features include: design simplicity, sensitive collapsing action, set-up ease and rugged construction. LL style Collapsible Taps are available for tapping taper threads from $1\frac{5}{16}$" to 20" in diameter.

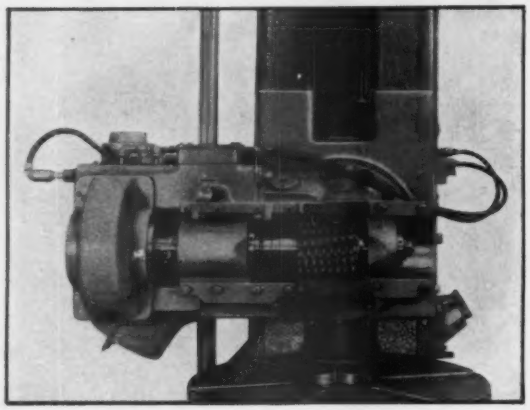
Landis produces over 160 sizes of tap bodies and detachable heads for producing threads from 1¼" to 24". Won't you investigate the possibilities Landis Taps have for your plant?

**LANDIS *Machine* COMPANY**

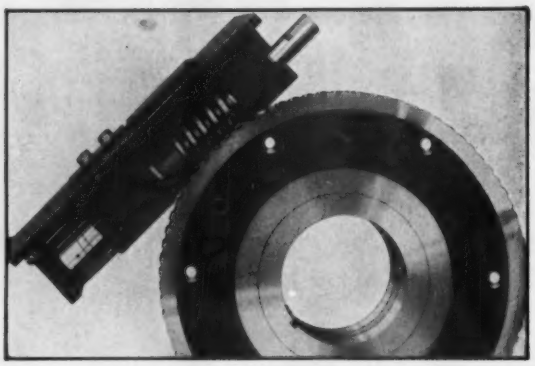
WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

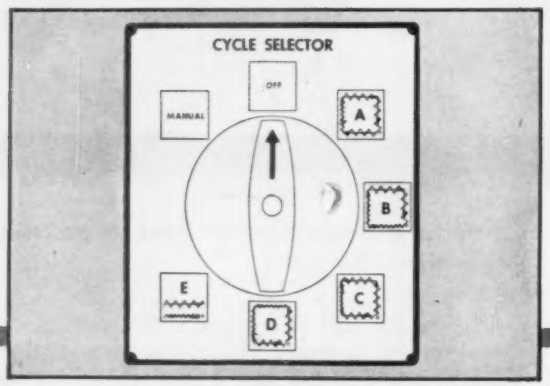
# On G&E Gear Hobbers you can get features like these...



Automatic hob shift apportions wear over entire hob length, throughout roughing and finishing operations. Hob spindle bearings rigidly clamped during cut.



DUALEAD worm gearing assures accurate indexing under heaviest production, at high operating speeds. Worm thread design simplifies adjustment, improves backlash control, assures uniform motion in both directions of rotation.*




Automatic Quadcycle with rough and finish cycle option makes gear cutting completely automatic. Operator needs only to load work and push RUN button. Specific cycles in an operation are selected by a single setting-dial.

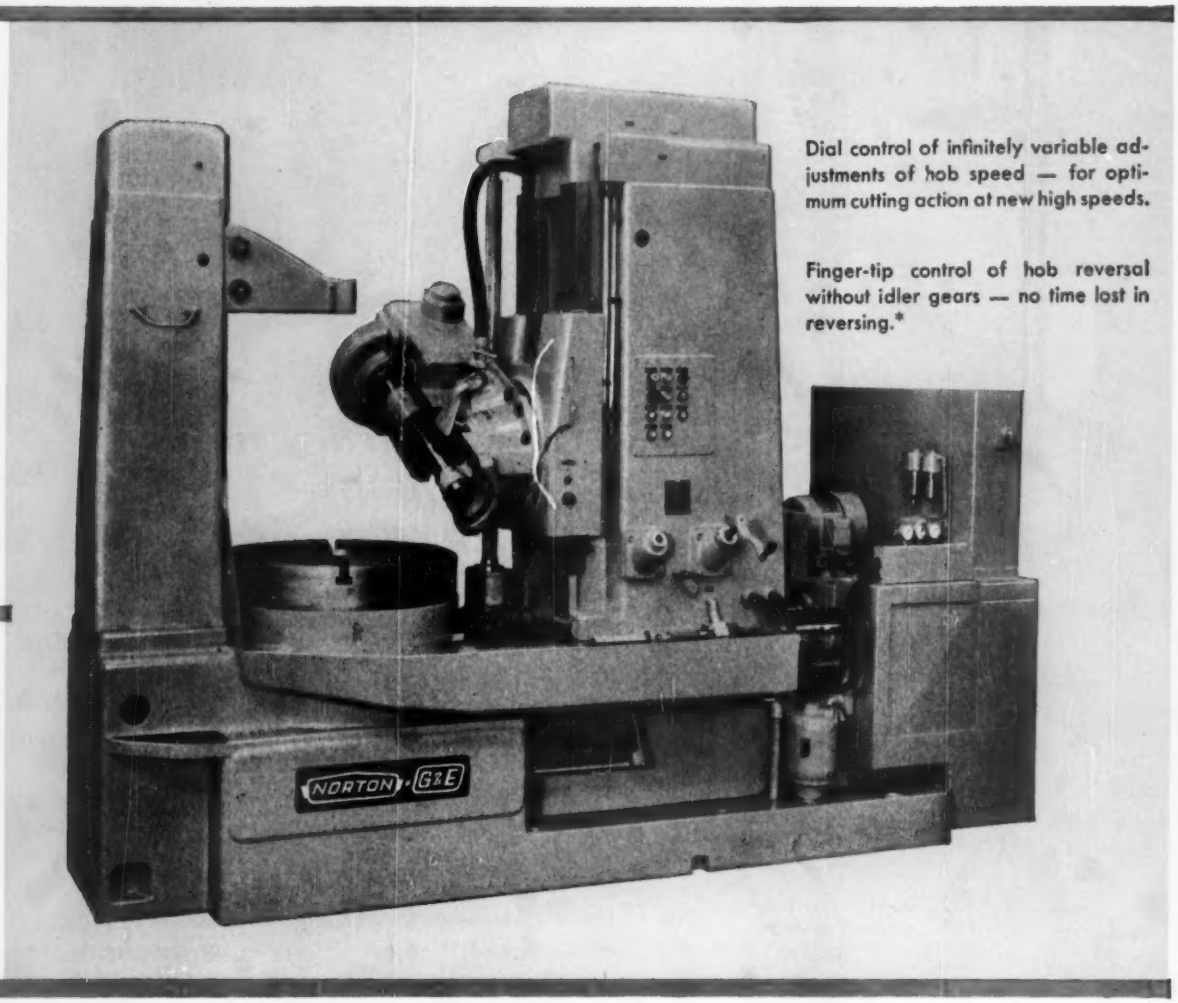
# plus advantages like these...

- Hydraulic counter balance of hob slide — variable to meet cutting conditions — eliminates backlash and chatter, permits high hobbing speeds, lengthens hob life.
- Tracer-controlled crown hobbing accurately produces a total amount of crown within a few "tenths", per inch of face. Simple inexpensive template locates high point and amount of crown anywhere on gear face. Also applicable to highly crowned couplings.

*Standard equipment

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

# with everything under control!




Dial control of infinitely variable adjustments of hob speed — for optimum cutting action at new high speeds.

Finger-tip control of hob reversal without idler gears — no time lost in reversing.*

Outstanding accuracy has long established G&E Universal Gear Hobbers as the most dependable machines for practically every gear cutting application.

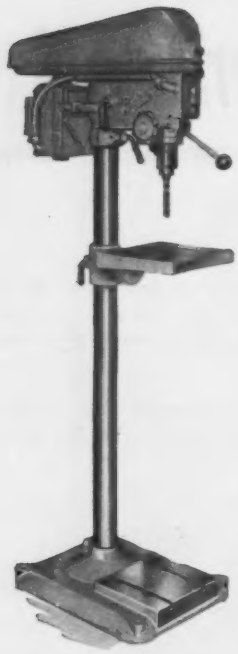
Precision performance is built into every G&E Hobber . . . with many advanced optional features like the ones described here . . . and with a simplified, control system that increases automatic, cost-cutting benefits in sustained high production.

G&E Hobbers are made in ten sizes to produce gears from one inch to fifteen feet in diameter, with most features available on all.

For expert aid in selecting gear hobbers and other G&E machines, see your G&E distributor — or write to Norton Company, G&E Division, Worcester 6, Massachusetts.

NORTON
MACHINE TOOLS
Making better products
. . . to make your products better

MACHINE TOOL DIVISION: Grinding and Lapping Machines — G & E DIVISION: Shapers • Gear Cutting Machines



'Buffalo' Heavy Duty
No. 15 Floor Model

## . . . extreme accuracy and dependability in production drilling

The mark of efficiency in a production drilling machine is the ability to maintain critical tolerances while operating at full capacity. This, of course, accompanied by an equal ability to perform continually with practically no maintenance of any kind.

No. 15 'Buffalo' Drilling Machines are designed for years of rugged use. Featuring superior frame strength, ball-bearing mounted spindles and pulleys, and a number of design refinements, they do their work quickly and accurately . . . there is no undue wear on any part. Belt adjustments are easily made from the front . . . all table and head adjustments are made without tools.

No. 15 Drilling Machines are available in 5 models including bench, floor, pedestal, multi-spindle, and heavy-duty units. All models can be operated at 5 speeds between 460 and 6300 rpm . . . special slow speed attachment is available for 112, 210, and 380 rpm drilling.

Pneumatic feeds, coolant system, and mortising attachment are optionally available. Ask your nearby Buffalo Machine Tool dealer for a demonstration. Or, request Bulletin 4024.

MACHINE TOOL DIVISION

**BUFFALO FORGE COMPANY**

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Wilbur C. Stauble,
President
VEEDER-ROOT
INCORPORATED
Hartford, Connecticut

# "THE MACHINE TOOL GAP...
## a hazard to us at home and abroad

"In my opinion, there's no greater hazard to American industry today — than the continued use of obsolete production equipment.

"Obsolescence handicaps the individual manufacturer, by making it difficult for him to keep up with better equipped competition — in output, quality, profits, and new ideas.

"It puts our country in an unfavorable position for world trade. And it can be a serious peril to U. S. military power and prestige.

"At VEEDER-ROOT, we are doing everything we can to help close this 'gap' — through consistent, planned replacement of machine tools."

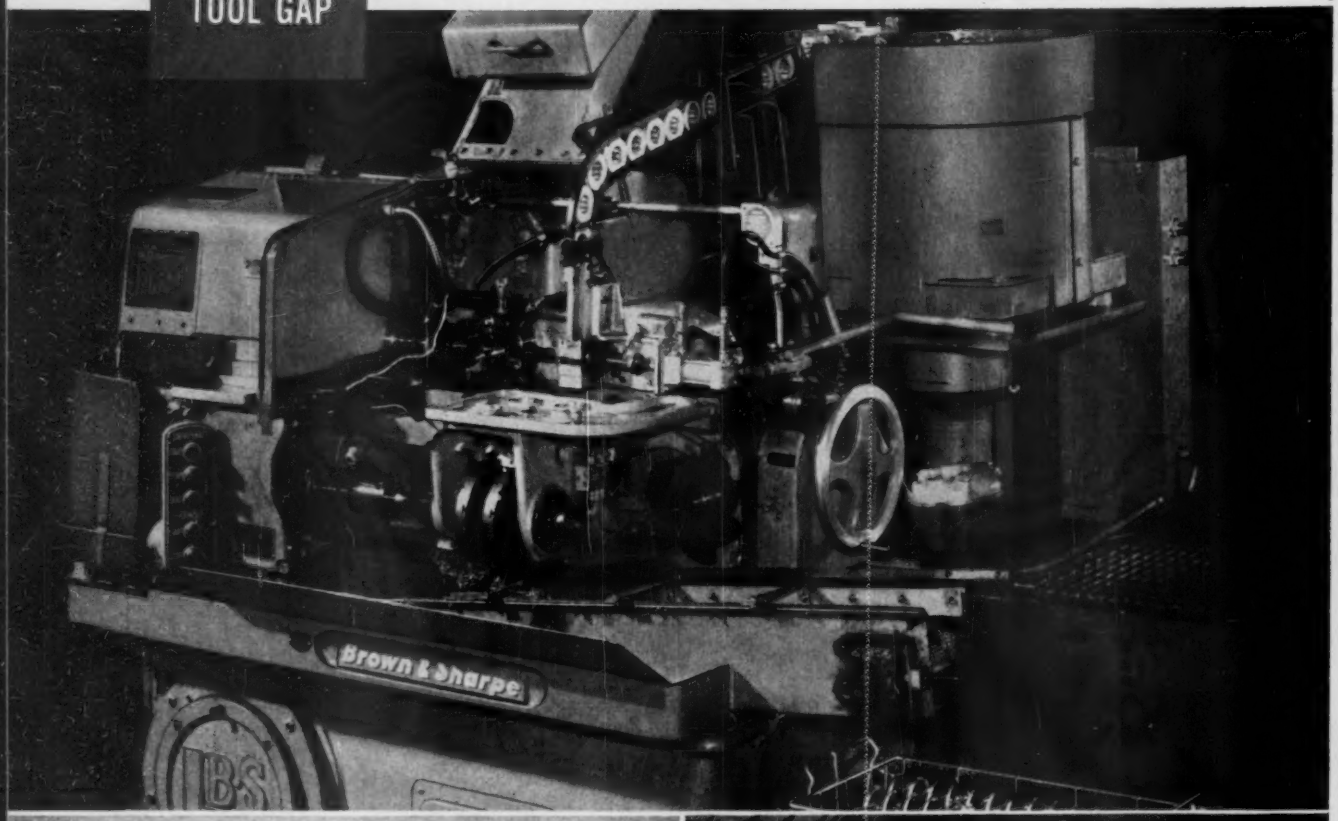
*This statement reprinted courtesy of Veeder-Root, Inc.*

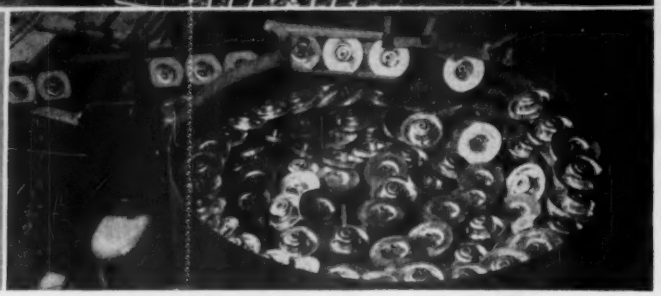
**Brown & Sharpe**

CIRCLE 270 READER SERVICE CARD

Close the MACHINE TOOL GAP

**MODERNIZE SCREW MACHINING** AND MAKE MORE FOR LESS





# B & S Automatic Hopper Feeder loading of die castings permits 8-operation machining at 240 pieces per hour

The new Brown & Sharpe Automatic Turret Loading arrangement shown eliminates "loading lag", keeps production costs of aluminum die-castings in line for a leading manufacturer of automatic transmissions. Five B&S No. 2 Automatic Screw Machines equipped with the Hopper Feeders are installed for complete machining of the various disc-shaped parts. All require up to 8 cutting operations on hubs, center holes, and outside diameters.

The biggest saving is in operator time. More machines can be tended, since feeding is fully automatic after the parts have been dumped into the hopper.

Parts are loaded from back end of turret, to minimize cycle time. Eight-hole turret permits use of 6 cutting tools, inserting tool, and taking tool.

The Hopper Feeders used for the above installation have special chutes and other modifications required to handle the die castings. The standard B&S Automatic Turret Loading arrangement, designed primarily for second operation work, takes parts up to 1¼" diameter and 4¼" length. B&S Tooling specialists will survey your operations at your request, and advise you of your potential savings. Write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

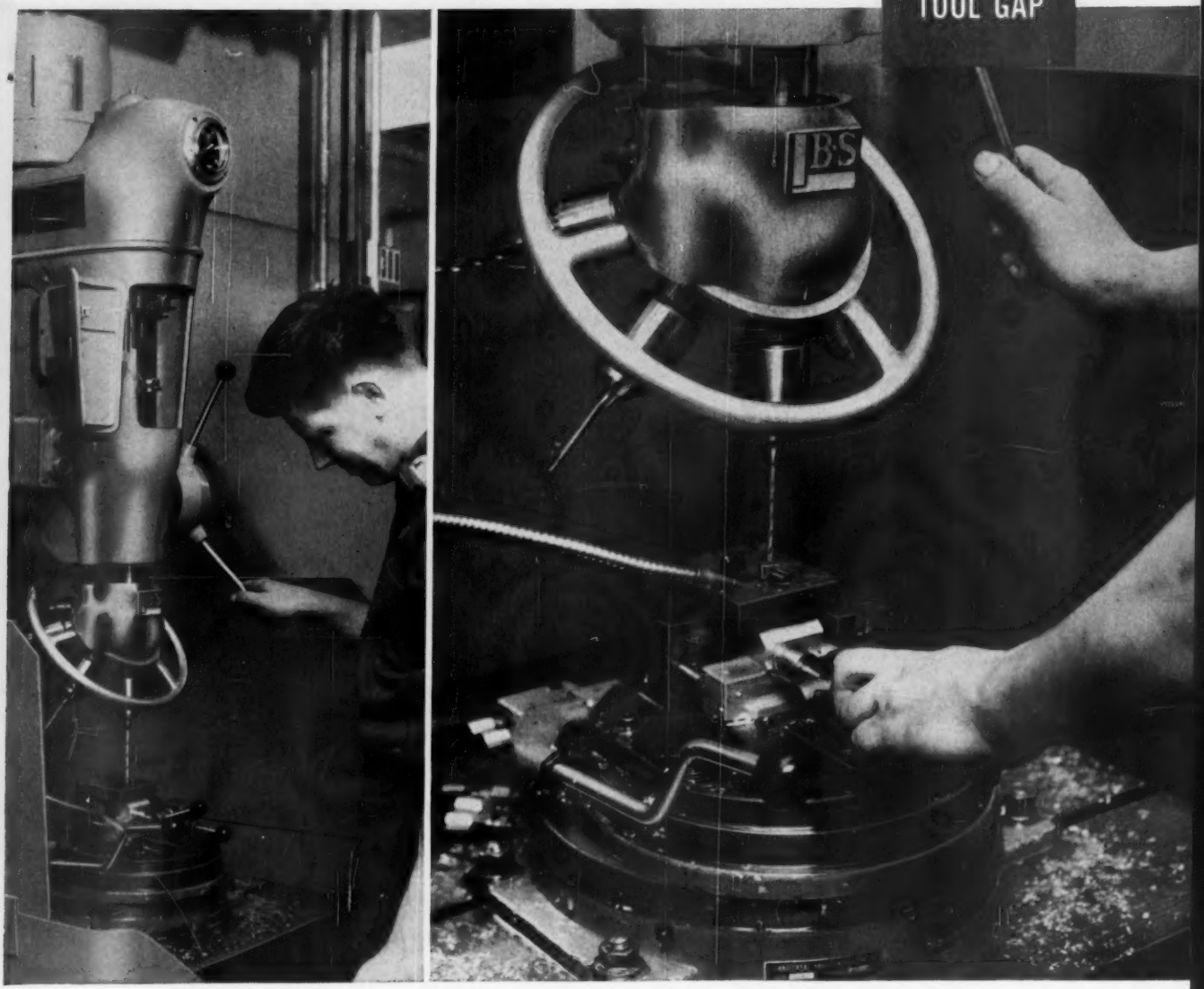
**From Hopper Feeder (above), castings are delivered continuously through chute to loading carrier mounted on the machine bed. Part is delivered to inserting tool in turret by air-operated plunger. Inserting tool is indexed and loads the part in chuck on the machine spindle.**

**Brown & Sharpe** PRECISION CENTER

CIRCLE 271 READER SERVICE CARD

**MODERNIZE DRILLING** AND MAKE MORE FOR LESS

Close the MACHINE TOOL GAP



## "At Raytheon, B&S Turret Drilling Machines and Positioning Tables save us money on missile parts"

*. . . Mr. Henry Sokolsky, Staff Industrial Engineer, Raytheon Company, Aero/Weapons Div., Lowell, Mass.*

"We're making substantial savings machining hydraulic valve blocks at Raytheon," says Mr. Sokolsky, "with Brown & Sharpe Turret Drilling Machines.

"We drill, ream, counterbore and tap at one station on the B&S Model A Turret Drilling Machines — much faster than in our former setup.

"We position the work in seconds, for each hole, on B&S Work Positioning Tables . . . cut handling time . . . eliminate expensive fixtures. And the critical tolerances required for these components, used in the Navy's III air-to-air missile, are successfully met.

"We're drilling and reaming all holes within ±.003" — counterboring to ±.002". We're intersecting holes within ±.005" — drilling accurate small holes, 4" deep."

*You* can save money with Brown & Sharpe Turret Drilling, too! You save on work transfer — setup time — jig costs — tool wear — floor space — capital investment. Get the facts from Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

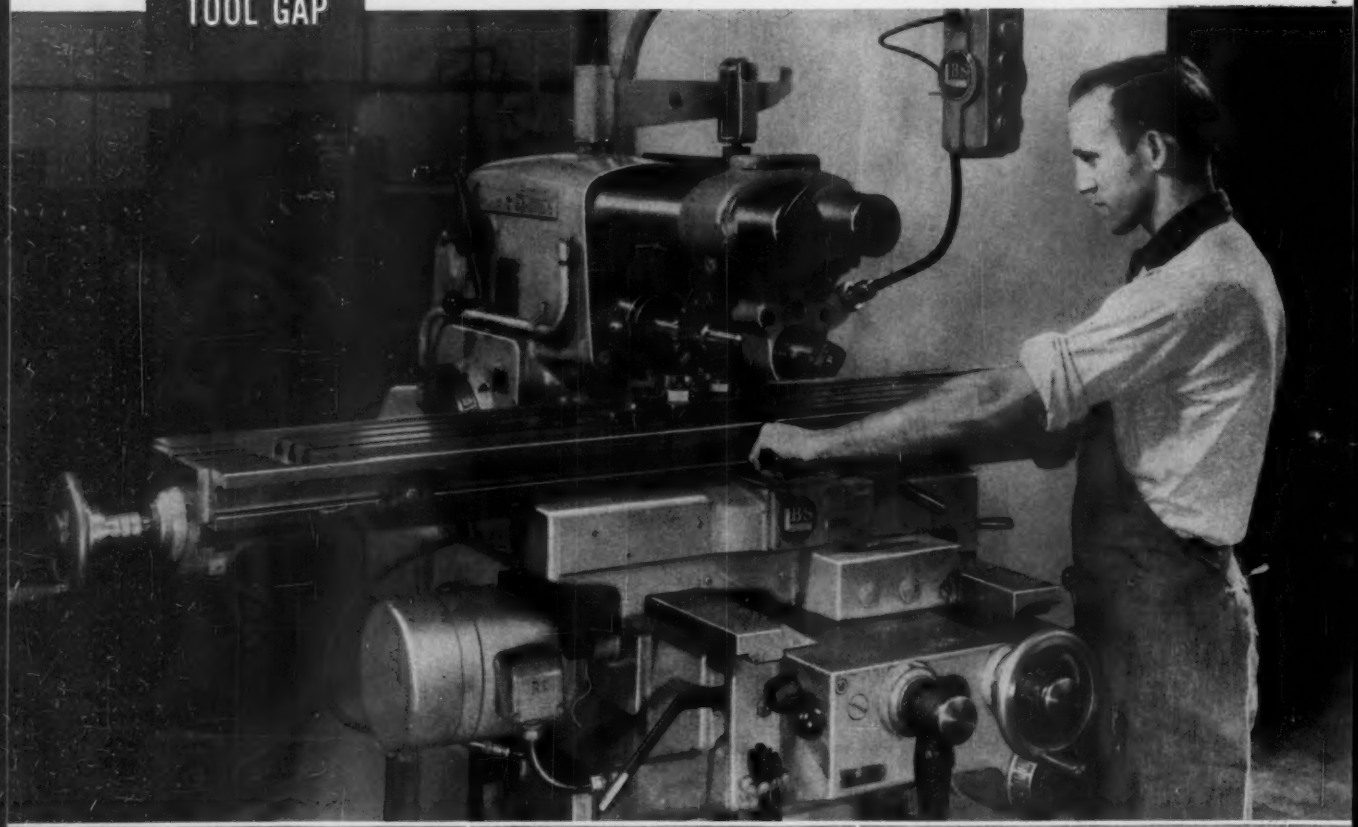
**The B&S Model A** Turret Drilling Machine (shown above) with 6 spindles and ½" drilling capacity in steel, has a 22"x24" work table. Model B, 6 spindles, with 1" capacity in steel, has a 28"x32" work table. Model B is also available as the TURR-E-TAPE, numerical tape — controlled for fully automatic operation.

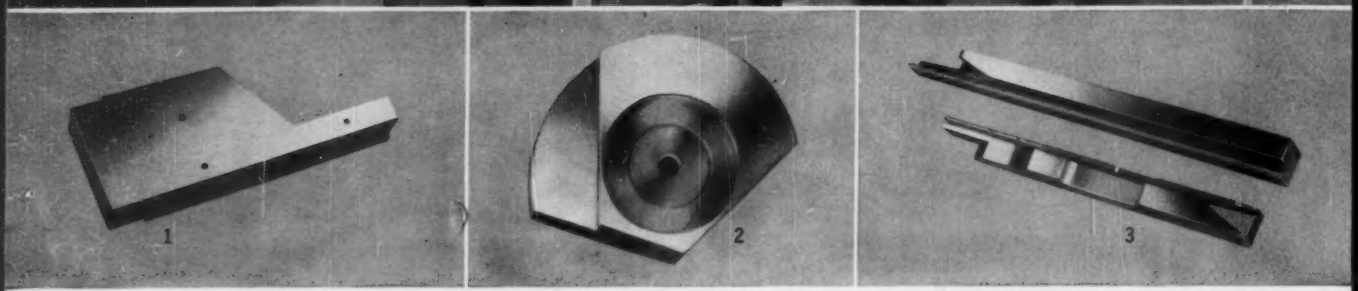
**Brown & Sharpe** PRECISION CENTER

CIRCLE 272 READER SERVICE CARD

Close the MACHINE TOOL GAP

**MODERNIZE MILLING** AND MAKE MORE FOR LESS






New B&S No. 2 Plain DYNAMASTER makes quick work of slotting operation on a double die part made of Air Die 150 steel. Tolerance: +.001/—.000. Other typical milled parts shown below are (1) Punch stripper, 1020 steel — 6 operations — tolerance ±.002". (2) Die shoe, 4140 steel — 5 operations — tolerance ±.005". (3) rails for cover plate of double die, 1020 steel — 2 slotting operations — tolerance ±.001".

# Apex trims costs of multi-cut die milling, meets +.001" tolerances, with new B&S No. 2 Plain DYNAMASTER

At Apex Die and Tool Works, Chicago, this new Brown & Sharpe No. 2 Plain Milling Machine is a reliable "work horse" . . . one of the busiest machines in a busy shop. When one job is finished, it is quickly set up for milling another of the hundreds of parts for dies and other tooling equipment produced for the can-making industry.

DYNAMASTER design provides the sturdy construction, setup convenience, and simplified control Apex needs to handle this big variety of work, and keep costs in line. The new No. 2 can take the cuts required faster, in tough tool steels, with either climb or conventional milling, and still meet tolerances as close as +.001/—.000.

For best returns on your investment in milling machines, the new B&S DYNAMASTERS take top rating — for toolmaking, experimental work, or production. The standard "building block" construction permits you to buy a machine "customized" to your needs at the price of the standard equipment. Automatic cycle, rise-and-fall knee positioning, climb milling, and double feed range are some of the optional arrangements available.

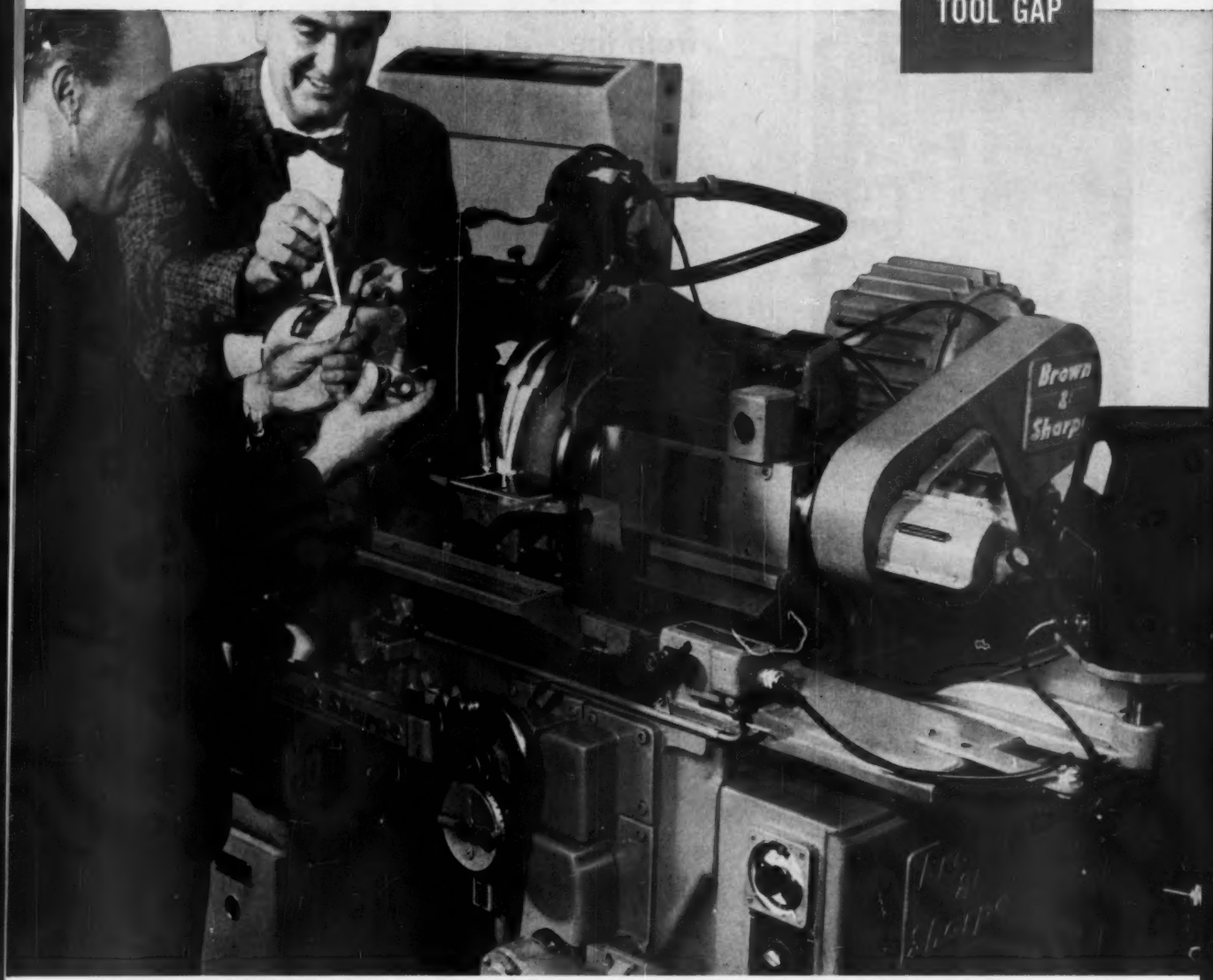
The DYNAMASTER series includes the No. 2 Universal, Plain, Vertical, and the No. 20 Rangemaster. Power range is 3, 5, 7.5, and dual 10/5 hp. Write: Brown & Sharpe Mfg. Co., Providence 1, R. I.

**Brown & Sharpe** PRECISION CENTER

CIRCLE 273 READER SERVICE CARD

**MODERNIZE GRINDING** AND MAKE MORE FOR LESS

Close the MACHINE TOOL GAP




T. F. Fitzgibbon, Hydraulics Division Manager (left) and C. A. Dotter, Shop Superintendent, have 3-years experience with the dramatic cost-saving performance of this, their first B&S CEDA/SIZE equipped No. 5 Plain Grinding Machine. A second machine has now been installed to extend this advantage. The new No. 5 provides traverse as well as plunge grinding of longer spool and sleeve assemblies to the same ultra-precision limits.

# Parker Aircraft cuts missile parts finishing time 50% – replaces hand lapping with B&S CEDA/SIZE grinding

"Meeting ten-millionths tolerances in the hydraulic system parts we make used to be a slow and expensive process," says T. F. Fitzgibbon, Manager of the Hydraulic Division of Parker Aircraft, Parker Hannifin Corp. "When producing servo-valve spool and sleeve assemblies, for example, we had to rough grind both pieces, then finish size and mate them by hand lapping.

"Now this entire job is completed on the Brown & Sharpe No. 5 Plain Grinder equipped with CEDA/SIZE. We can plunge grind spools to limits of 0.000010" in size, roundness, and taper. Also, with the B&S Electro-mate gauging equipment, we can match grind a spool to the bore of a sleeve within 0.000020" of any required clearance. We can also be sure of geometry control.

"We've reduced our hand lapping stations from 10 to 2, and are putting 100% more work than before through our grinding and finishing department."

If your production of precision parts is still paced by slow lapping, find out how much you can save with B&S CEDA/SIZE grinding and Electro-mate. For complete information, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

**Brown & Sharpe** PRECISION CENTER

CIRCLE 274 READER SERVICE CARD

When the job calls for MICRO-PRECISION put it on a Wade Variable Speed HAND TURRET or FINISHING LATHE...

- Turn to a 5/ finish
- Turn round to 25 millionths
- Hold concentricity .0002" on 5 or 6 diameters
- Perform 7 distinct operations at one chucking
- 1 1/16" or 2¼" collet capacity
- One-second cycle with a standard motor through electric clutch drive
- Variable speed from 140 to 3500 RPM by push button control

NOW MANUFACTURED, SOLD AND SERVICED BY OVEL MFG. CO. Benton Harbor, Michigan

Send today for full details—Dept. A91.

# LETTER from the PUBLISHER

## What Is Right

The moment of truth in the Berlin crisis is upon us. Will the United States stand fast; or will we allow international gangsterism to call the turn, to mousetrap us into a negotiated settlement in which we lose just a little more to the forces of darkness?

### Nothing to negotiate . . .

We are in Berlin by right of treaty. We have the right to stay there. Furthermore, we have the power. Mr Khrushchev does not have the power. If he did he would *take* Berlin. So now Mr Khrushchev lets it be known he will negotiate; on his terms, of course.

There is nothing to negotiate unless Mr Khrushchev wants to take down the wall between East and West Berlin; unless he wants to free the enslaved countries of Eastern Europe. But Mr Khrushchev wants to take, not give.

### Is it right? . . .

In this hour of trial, the President gets advice and counsel from all quarters. Most of it urges him to act on the basis of what is expedient. The timid urge him to give up Berlin. The pragmatists urge him to make the best deal he can. The warriors urge him to stand fast. Nowhere in this land, however, has a voice been raised to ask one simple question: *Is It Right?*

Is it right to build a wall to keep people from crossing a border to freedom? Is it right to shoot these people when they try to cross that border? Is it right to enslave millions of people, refuse them the right to govern themselves, and murder them in the streets when they try to exercise that right?

Of course not! If it is, then America and all it stands for is wrong: If America does not stand fast against the forces of Communism, the world will not stand fast. Our strength is that we believe in right. Our history has been made by men with the courage to stand in the right against overwhelming odds.

There is only one way for America: The way of freedom. Berlin is the place to start proving it. Let us end the long retreat. Let us state simply that we stand firm in the right and act accordingly. Then the world will know the crusade for the freeing of the slaves of Communism has at last begun.

George Reppert

# HOW PROFITABLE IS YOUR SMALL LOT GRINDING?

Grinding a wide range of workparts on a small lot basis can't be done profitably or accurately with toggled up grinding attachments and light-weight machines. It can't be done with machines intended for long run, high-production grinding either.

Profitable small lot grinding depends principally upon rapid job change-over. This requires a versatile heavy duty, large capacity grinder built and tooled to rapidly handle the widest possible variety of grinding jobs. That's why more and more job shops and tool rooms are installing Bryant Universals.

The massive, workhorse construction of the Bryant Universal assures you the same high accuracy of production you get with all Bryant grinders. Mass production methods and spartan design put it well within the economic reach of both large and small plants. Why not let us give you complete details?

## EXCLUSIVE FEATURES

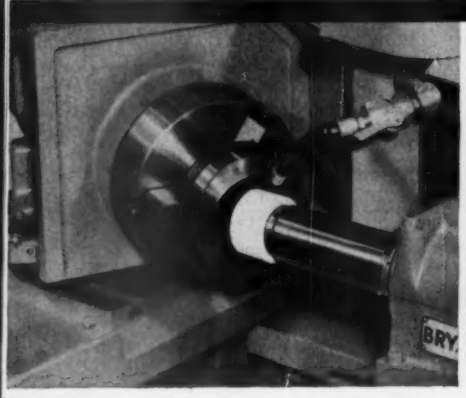
**Compound Cross Slide** — Locating the cross slide and controls below the traverse slide results in the lightest possible reciprocating mass. Slide sensitivity is increased . . . wear reduced. No moving controls!

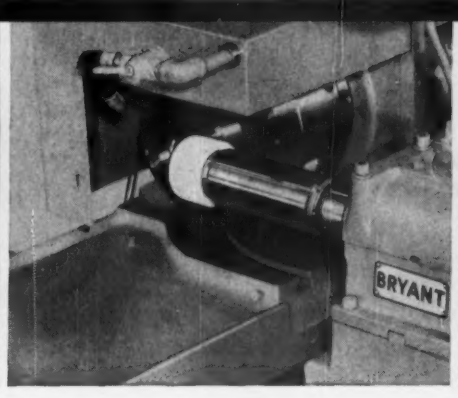
**Large Work Capacity** — You can swing 16" diameter work within the splash guard . . . handle 23" diameter with guard removed.

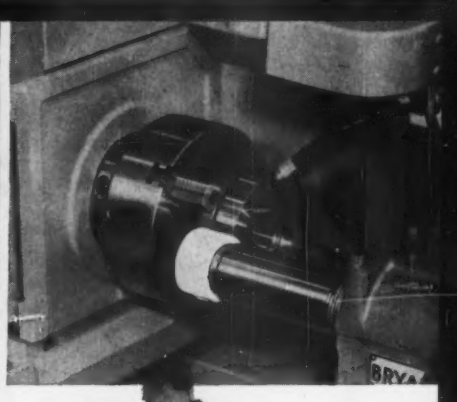
**Reversible, Hydraulic Work Drive** — Variable speed range from 50 to 500 R.P.M. provides the best grinding conditions for each job.

**Multiple Wheel Spindle Positions** — Precision T-slot construction permits longitudinal spindle positioning anywhere within a 16" range. This and two lateral wheel spindle positions team with 15½" of cross slide travel for rapid set-up and handling of all jobs.

**Cam Lock Spindle Nose** — a standard 6" type DL-ASA cam lock spindle nose speeds changing of all standard tool room fixtures.





# BRYANT

## Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT, U.S.A.

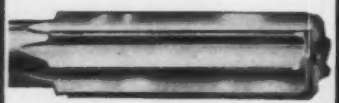
*Internal Grinders • Special Machinery*

CIRCLE 276 READER SERVICE CARD

holes we had nothing to do with

L&I reamers are **not** used in donut making. But almost any place else in the metalworking field, chances are you'll find L&I reamers used for precision finishing and sizing of holes. L&I offers you **the most complete line of reamers** including miniature sizes, wire gage sizes, letter sizes, dowel pin reamers, fractional reamers by 64ths, all in both straight and spiral flutes. This means lower first cost . . . greater efficiency . . . increased production . . . and more savings per reamed hole.

**FREE! A POCKET CHART OF DECIMAL REAMERS.** See your L&I distributor or write today.



L&I

**LAVALLEE & IDE, INC.**

*"THE REAMER SPECIALISTS"*

CHICOPEE, MASSACHUSETTS

# LETTERS

## to the editors

330 W 42nd St, New York 36, NY

### Time Values Too High?

Dear Sirs:

We are in possession of six copies of your report entitled "How to Estimate Dies, Jigs and Fixtures," by Leonard Nelson (*AM/MM*—Sep 4 '61, p111-122). Upon re-examination several questions arise in the calculation of times. In every instance the times arrived at are very excessive, being several times too high according to our data.

Is it possible that the times are not full hours, but tenths of hours? Are we interpreting the tables correctly?

R J Hill
*Supervisor,*
*Machine Shop Estimating*
*Dominion Engineering Works*
*Montreal, Canada*

*Author Nelson's reply: "The times in the tables are correct. These times include the making of a punch press die with the physical characteristics outlined in the article. While the table times may be on the high or low side, compared to those in a particular shop, the shop's deviations from the table times will be consistent. All the shop need do, then, is determine a suitable constant, based upon its own conditions."*—Ed.

### Greater Accuracy

Dear Sirs:

Your October 30th issue on numerical controls contained a section on our unit, Hydra-Point. The content was excellent. However, the repetitive accuracy was incorrect. The article read that the repetitive accuracy of the system was 0.003 inch. This should be corrected to read 0.0003 inch.

O C Laird, Jr
*Sales Manager*
*Moog Servocontrols, Inc*
*Industrial Div*
*East Aurora, NY*

*We're happy to make this correction*—Ed.

### The Profit in N/C

Dear Sirs:

Your special report, "How to Prove the Profit in Numerical Control," (*AM/MM*—Oct. 30 '61,

### SHOPMATES

*N. Jarvis*

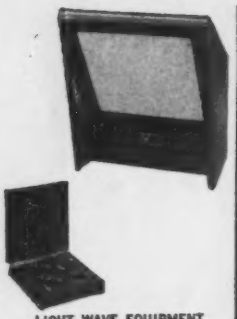
HARDINGE
ELMIRA, N.Y.

SUPER-PRECISION

# TURNING, FACING AND BORING LATHE

*Model TFB-H*

***This Is Our New Model Designed And Manufactured To Meet Exacting Requirements For Close Tolerances And Fine Finish.***



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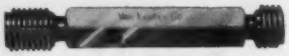
OPTICAL FLATS

WIRE TYPE PLUG GAGES

TAPER LOCK PLUG GAGES



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PLUG GAGES

THREAD PLUGS
AND RINGS

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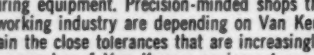
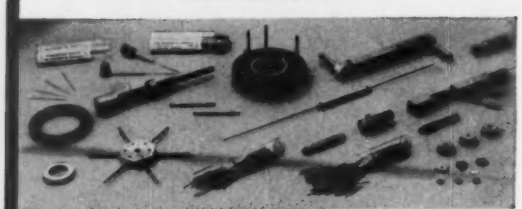
THE NEW MODEL "60"
LIGHT WAVE MICROMETER
WITH VERNIER GIVING DIRECT READING TO TEN MILLIONTHS

# K precision measuring tools

The World's most accurate Precision Measuring Tools — tools which check to hundred-thousandths and millionths of an inch — are members of the Van Keuren family of highest quality measuring equipment. Precision-minded shops throughout the metalworking industry are depending on Van Keuren gages to maintain the close tolerances that are increasingly in demand. Some examples of Van Keuren equipment are shown here; write for complete Buyer's Catalog.



MASTER SETTING DISKS



HYT
GAGE

For setting any dimension from ¼" to 12" in .0001" steps • Fifty millionths accuracy over range • Speeds up dimensional setups • 180° accessible measuring surfaces • Easily portable • Can be used horizontally • Decided price advantage

## PRECISION LAPPING SERVICE AND PIVOTS

Van Keuren offers a highly specialized service devoted to the production of precision lapped finishes on parts supplied by customers or manufactured to specifications. Precision steel or carbide pivots with radii, close tolerances and high finish are an example. If the part has "at least one gage characteristic", consult Van Keuren for assistance.

MICROGAGES • THREAD MEASURING WIRES • GEAR MEASURING WIRES

THE VAN KEUREN CO.

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Precision Measuring Tools . . . rated the world's most accurate

Plug and Ring Gages • Plain and Thread Gages • Gage Blocks
Optical Flats and Light Wave Equipment • Measuring Wires
Precision Lapping Service and Parts


p77-120) certainly should be most beneficial to those people who want to evaluate this method with regard to their particular production problems.

As a machine tool distributor we have ordered copies for each member of our organization to further acquaint them with justification procedures which will help us do a better job selling this media of control with the machine tools that we market. Congratulations on a fine presentation.

Robert A Cole
*Sales Manager*
*Tornquist Machinery Co*
*Los Angeles, Calif*

## The Big Squeeze

Dear Sirs:
I read with great interest your recent editorial on apprenticeship training, "How to Avoid the Big Squeeze" (*AM/MM*—Oct 2 '61, p79).

I believe your editorial is timely and well written. While we receive several copies of your magazine in our library, I would like your permission to reproduce ten copies of your editorial to distribute to the supervisors of the departments where we have apprentices.

R E Kline
*Director, Educational-Training*
*The National Cash Register Co*
*Dayton, Ohio*

*Permission to reprint granted, with pleasure*—Ed.

## Switch in Titles

Dear Sirs:
We at Surface Combustion were most interested in the excellent article, "New Furnaces Triple Bearing Output," (*AM/MM*—Nov 27 '61, p90), along with the color photograph on the cover.

However, we note that a typographical error interchanged the titles of the authors. At the Tyson Bearing Co, Mr William H Smyth actually is plant manager, while Mr. Robert Lamb is plant metallurgist.

Quinten Kenny
*Surface Combustion Div*
*Midland-Ross Corp*
*Toledo, Ohio*

*We're happy to set the record straight*—Ed.

## CALENDAR

**Society of Automotive Engineers** —Annual Meeting and Display, Jan 8-12, Cobo Hall and Convention Arena, Detroit, Mich.

**Joint National Symposium on Reliability and Quality Control,** Jan 9-11, Statler Hilton Hotel, Washington, DC.

**Society of Plastics Engineers** — Annual Technical Conference, Jan 30 - Feb 2, Penn - Sheraton Hotel, Pittsburgh, Pa.

**Material Handling Institute** — Spring Meeting, Feb 6-8, Hilton Inn, Atlanta, Ga.

**American Society for Metals** — Golden Gate Metals Conference, Feb 15-17, Fairmont Hotel, San Francisco, Calif.

**Society of Automotive Engineers** — National Automobile and Production Meeting, Mar 12-16, The Sheraton Cadillac, Detroit.

**American Metal Stamping Association** (formerly **Pressed Metal Institute**) — Spring Technical Meeting, Mar 14-16, Commodore Perry Hotel, Toledo, Ohio

**Society of Automotive Engineers** —National Aeronautic Meeting and Display, Apr 3-6, Hotel Commodore, New York, NY.

**American Welding Society**—43rd Annual Convention and Exposition, Apr 9-13. Technical Meetings, Sheraton Cleveland Hotel; Welding Show, Cleveland Public Auditorium, Apr 10-12, Cleveland, Ohio.

**American Society of Tool and Manufacturing Engineers**—1962 Engineering Conference and Exposition, May 7-11, Cleveland, Ohio.

**American Foundrymen's Society** —Castings Congress and Exposition, May 7-11, Cobo Hall, Detroit, Mich.

**American Institute of Industrial Engineers** — National Conference, May 17-19, Ambassador Hotel, Atlantic City, NJ.

**Society of Automotive Engineers** —Summer Meeting, June 10-15, Chalfonte-Haddon Hall, Atlantic City, NJ.


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No. 65 for Drilling • No. 66 for Drilling & Tapping

LOWEST PRICED AMERICAN MADE UNIVERSAL DRILLING & TAPPING MACHINE

Basic Drilling Machine Price Starts at Only $1195.00 (Less Spindle Assemblies)

Floor Type, Self-Contained Universal Joint Drilling & Tapping Machine.

Designed for Small Parts Production Where Small Hole Drilling and Tapping is Required.

12 Spindle Drivers, 4 Speed Selections. T Track Vertical Feed Work Table.

Capable of Standard Center Distances down to .390, closer upon specific application.

- Head remains stationary while counter balanced table feeds work pieces up to drills or taps.
- Rapid changeover from one job to another. Well suited for either short or long runs.
- Work table features 2 "T" tracks, has adjustable depth stops. Depth controlled either mechanically or electrically.
- Standard spindle assemblies can be arranged in jig bored cluster plates to your prints, or used with adjustable arms. Over 35 standard spindle assemblies available to fit any job.

Overall Height 66"
Height from floor to Work Table 39"

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# reduce rejects on high speed automatics...

# with *Carpenter* stainless machining bars

**Not one reject on this critical part since changing to Carpenter Stainless No. 8 (Type 303)!**

Specifications on this part called for a .1585/.1595" hole to be drilled to a depth of 2-11/16 inches through the shaft with eccentricity not exceeding .004 T.I.R. Finish of the hole could be no less than 63 micro inch. The lack of consistency in a competitive stainless Type 303 often caused such a high reject rate that entire lots had to be scrapped! With Carpenter Stainless No. 8 rejects have been completely eliminated.

What are your requirements? No matter how critical, the consistent uniformity of Carpenter Stainless Machining Bars will pay you dividends. For immediate delivery call your local Carpenter SERVICE-CENTER. **The Carpenter Steel Company, Reading, Pa.**

*Carpenter* **steel**

you can make it ***consistently*** better with Carpenter Stainless Machining Bars for Specialists



CIRCLE 281 READER SERVICE CARD

CIRCLE 282 READER SERVICE CARD ►

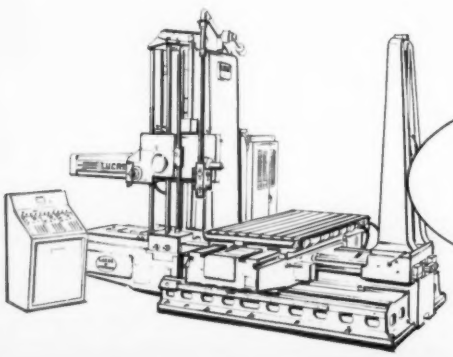
# Versatility of Performance?

# LUCAS

Lucas offers the widest range of machining operations possible on boring, drilling and milling equipment. The same versatility of application applies to work ranging from precision missile components to big castings and forgings weighing tons . . . on models ranging from 2¾″ to 7″ spindle diameter.

*Point-to-point positioning.* Milling (face milling, picture frame milling, right angle milling), boring (line and stub), drilling, tapping, threading, plus *contouring and profiling of complex surfaces.* Repetitive accuracy to ±.0001.

If your replacement or expansion plans include the addition of either vertical or horizontal table type or floor type boring, drilling and milling equipment, get the details on what Lucas has to offer. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio.



**LUCAS**
PRECISION

# Saddle feed?
# LUCAS

. . . plus precision flame-hardened column, table and saddle ways; a full range of speeds and feeds; maximum rigidity for precision machining accuracy on the heaviest cuts; air-lift to saddle and table during rapid traverse and every other major design and construction feature is available on Lucas boring, drilling and milling machines. These aren't the things we are going to incorporate someday, they are the accomplished cost-cutting features already at work in the field. Whether you require point-to-point positioning or contouring of complex surfaces, tape control or conventional pendant and/or lever control, Lucas represents the best value for your machine tool dollar. Before you decide on any other equipment for boring, drilling, milling and related operations, talk to your Lucas dealer or write Lucas Machine Division, The New Britain Machine Co., 12302 Kirby Ave., Cleveland, Ohio.

**LUCAS**
PRECISION

# SPOT NEWS...

- **E W Bliss' purchase of Portland Copper & Tank Works,** (S Portland, Me) provides Bliss with an entry into the rocket and spacecraft field. With the purchase, Bliss gets the rights to the Ardeform process of cryogenic metal forming (*AM/MM*—Sep 4 '61, p103), a newly developed technique that has produced stainless-steel rocket cases with ultimate strengths of 260,000 psi without heat treating.

- **Industry, not labor, is terminating a wage agreement in Germany.** The 14 associations representing German metalworking firms have given notice on contracts expiring Dec 31. Unions want a 10% wage increase and an increase in paid vacation. This follows close upon a weekly work hour reduction. Industry expects tough negotiations; a strike is possible.

- **A $40 million saving in the Titan ICBM program for 1962 is the goal** set up by industry in close cooperation with the Air Force. Titan funding for the year is $1.2-1.3 billion, but is expected to be cut back severely in 1963. Col John L McCoy, Titan systems director for the Air Force Ballistic Systems Div, reports that Martin Marietta's Denver Division and its subcontractors have effected savings of $15 million through cost reduction programs this year.

- **Kearney & Trecker CVA, Pratt, and A A Jones & Shipman** (all of England) have entered into an agreement with Praga Tools Corp of Hyderabad, India, whereby K&T CVA will provide know-how on drill chuck manufacture; Pratt will do likewise for lathe chuck manufacture; and Jones & Shipman will grant Praga exclusive Indian manufacturing rights to its tools and cutter grinder.

- **Continuous ultrasonic inspection of incoming punched billets** is done by Superior Tube Co (Norristown, Pa) to insure that the wall thickness of tube hollows is within 0.0001 in. of dimension and concentricity. With a Vidigage ultrasonic resonance gage, built by Branson Instruments, Inc (Stamford, Conn), Superior selects billets that should fulfill ultimate tubing tolerances, then checks by inspecting finished tubing.

- **Ford plans to install US presses, transfer machines,** dies and other production equipment and accessories in an expanded truck plant in Buenos Aires and in a new car-making plant in the suburbs. General Motors and American Motors also have the Argentine government's approval to set up passenger-car manufacture on a schedule calling for 90% of the content to be made in Argentina within a few years. Volkswagen is already fully established in Argentina.

- **US industry is boosting its capital spending plans** for the first quarter of 1962, according to the latest government figures. Plant and equipment spending will hit a seasonally adjusted annual rate of $36.5 billion during January-March. The recent McGraw-Hill survey (*AM/MM*—Nov 13 '61, p117) indicated 1962 outlays would total $35.84 billion.

- **The Internal Revenue Service has spelled out how textile companies** may apply the new, faster write-offs to equipment already on hand. In its memorandum (TIR-350), IRS gives examples covering all three methods of write-off (straight-line, sum-of-the-digits, double-declining-balance). It is expected that a similar provision will apply to other industries for which new useful lives are now being studied. (See page 39.)

*One in a series of performance studies of Armour Coated Abrasives*

# ARMOUR coated abrasives work for Chrysler

*. . . help Chrysler produce 55 cars an hour*

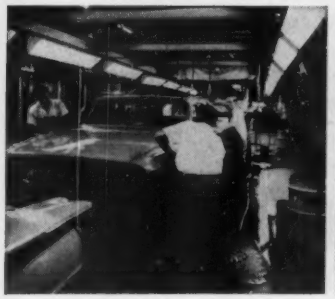
"Armour abrasives contribute to the quality finish that identifies our 1962 automobiles," says a company spokesman at Chrysler's Newark Assembly Plant in Newark, Delaware. Over 4400 Dodge Darts, Lancers, Plymouths and Valiants are produced for the eastern states every week here.

"All abrasives used here are job-tested. We take competitive abrasives and work them under exactly the same conditions. We even use the same men since each operator has his own working characteristics which exert different kinds of wear on the abrasive. Armour meets every one of our specifications," he continues.

No matter what your production requirements are, it will pay you to use Armour Abrasives. Our standing offer is—put Armour to work on your toughest jobs. Then look at the improved results —more production, higher quality, less downtime and less cost.

Armour distributors are located throughout the country. They're experts in the abrasive field and have the technical background to assist you on your toughest jobs. In addition, they're backed by over fifty years of Armour's experience in solving the most diverse abrasive problems.

Wouldn't you like a detailed technical report describing Chrysler's experience with Armour Coated Abrasives? Write for Report M-101 to Armour Alliance Industries, Coated Abrasives Division, Alliance, Ohio.



Assembly workers use Armour 360 grit Rubwet® paper to sand down excess paint after trim paint has been applied to 1962 Dodge. Quality-controlled production of nearly a car a minute requires a tough, efficient, long-lasting abrasive.

Seven different sizes of resin fibre discs with five different grits are used to grind down a mixture of 4% tin and 96% lead solder at the body joints. High production rates call for high performance Armour resin fibre discs.

## the new Armour and Company

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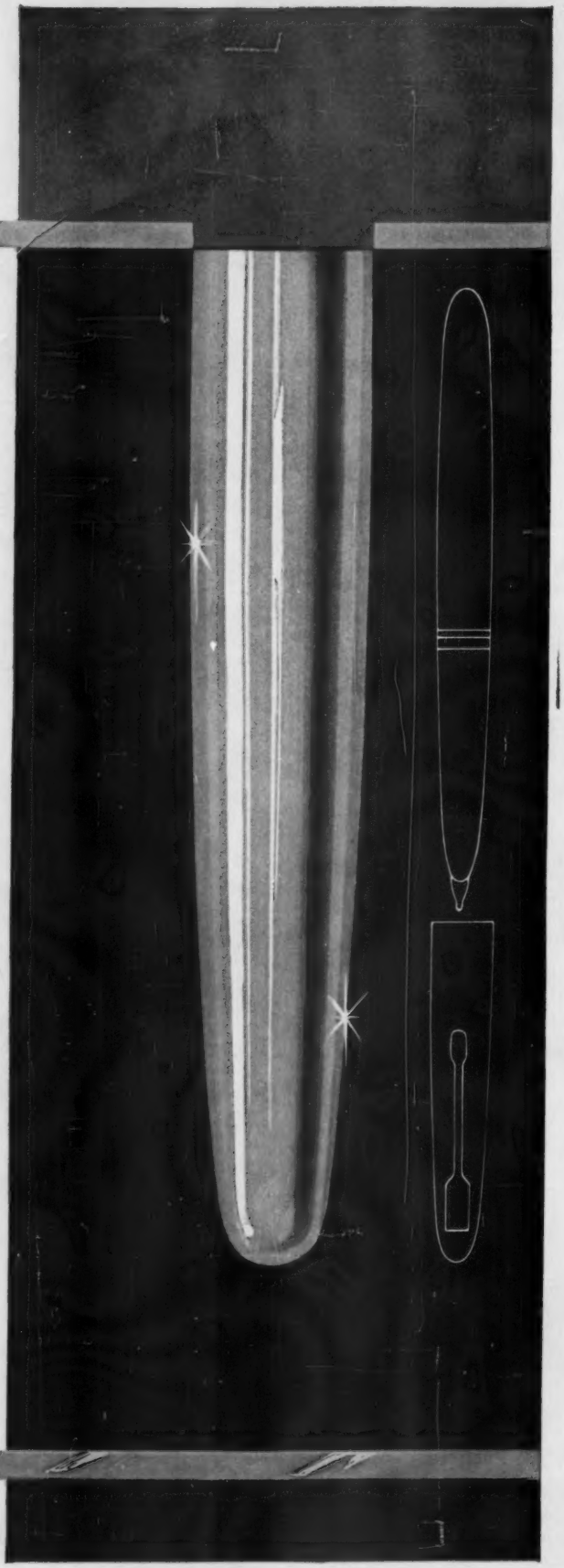
**SUPERFINE-GRAIN DRAWING BRASS**



## smooth and easy on the draw!

Formbrite . . . an exclusive Anaconda product, is springier, harder, more scratch resistant . . . provides better finish before and *after* forming . . . than the usual drawing brasses in the same standard tempers. It has remarkable ductility for forming and drawing—even such deep-drawn products as pen barrels. Yet it costs no more than ordinary drawing brass, despite its superiority.

When you buy or specify Anaconda American Brass, you can choose from nearly 300 different alloys . . . the greatest range of sizes, shapes, tempers and characteristics in Copper and Copper Metals. Contact your Anaconda representative or write: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 61-1146

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**AMERICAN BRASS COMPANY**

# WASHINGTON...

## Bulletin F revision promised . . .

Bulletin F revision has been promised by next spring. Secretary of Treasury Douglas Dillon has flatly promised this with his recent announcement that the Internal Revenue Service will give priority to studies of six major industries during the next couple of months—and if need be, apply its findings in these industries to other industries to get new useful lives published early next year.

**The major types of machinery and equipment** used by the metalworking machinery and machine tool industry, the aircraft and parts industry, the auto industry, the electrical equipment and machinery industry, railroads, and steel mills will be examined by the IRS engineers.

**Secretary Dillon is putting the pressure on** IRS Commissioner Mortimer S Caplin, who has been stressing the complexity and difficulty of arriving at new Bulletin F lives. The Treasury statement says that the six-industry study is scheduled for completion by the latter part of January 1962.

**These six industries were picked** because they are large, basic industries, and because they differ widely in their level of automation and recent experience with technological change.

**There are other reasons** for selecting these six. One, for instance, is that IRS has been flooded with demands from all kinds of business that they quickly be given their decisions on more liberalized write-offs. The announcement clears the air on this score.

**The six industries picked also are among** the most powerful—economically and politically—in the entire economy. By giving them priority treatment, the administration hopes to reap political benefits on behalf of crucial administration legislative programs this coming year—reciprocal trade and the tax revision bill, for instance—both of which will need all the business support that the administration's lobbyists can muster.

**Some 50 firms and trade associations** in the six industries will be asked to cooperate with the IRS experts in determining the extent to which technological obsolescense, now and in the near future, should be taken into account in setting new useful lives.

**This is the procedure** the administration followed in reducing the Bulletin F lives for textile machinery last October. That decision resulted in giving textile makers 15-year useful lives on one class of equipment previously listed for 25-40 years; another class of equipment was reduced from 15-20 years to 12 years.

**Secretary Dillon's announcement** said that additional engineering studies for industries other than these six "will be started as soon as possible." If these studies are not completed, Dillon declared that new useful lives for other industries will be announced anyway, provided the information available indicates that they are justified.

**Treasury officials expect to have ready** for presentation to the Joint Internal Revenue Committee of Congress in January the results of its survey of the useful lives that industries were actually using back in 1959. There never has been an authoritative study of this subject.

**Officials say privately** that the data indicate a wider use of the faster write-off methods allowed by the 1954 law than has been guessed up to now on the base of very limited surveys on the subject.

## Trade policy outlook . . .

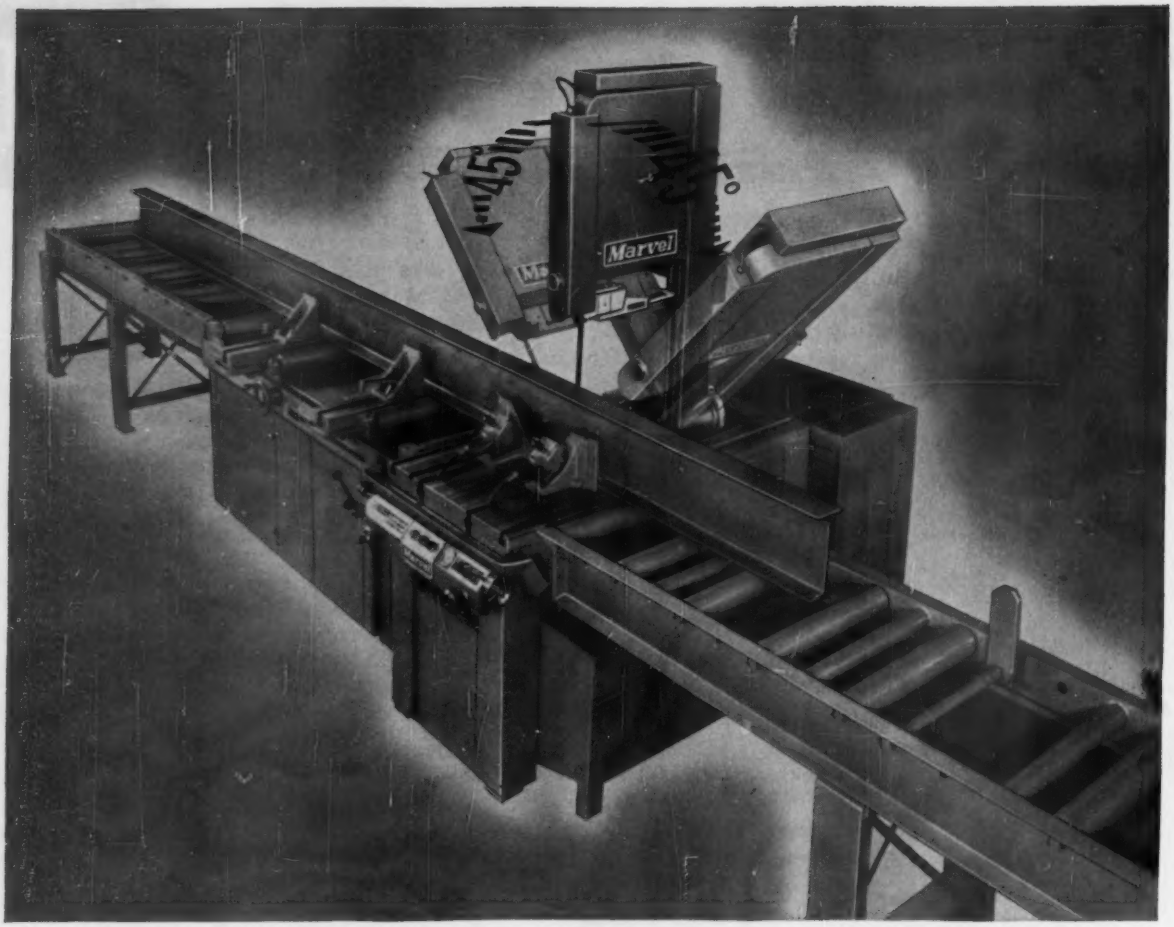
The Kennedy administration's new trade policy is beginning to shape up more clearly, and many industry leaders are finding it not as distasteful as they had anticipated. The White House does not propose taking the US into the European Common Market.

**The goal is an eventual free flow** of goods between this country and Western Europe. The President is willing to make concessions to domestic industries that may be hurt by foreign competition to tide them over the years of the most serious impact.

**Details on the concessions** have yet to be ironed out. They are expected to include tax assistance to the hardest-hit industries, federal aid to injured industries and local communities, a federally financed worker retraining program, and the like.

**There is even a White House hint** that the concessions might include some form of tariff adjustment for industries which could show excessive injury due to liberalized trade.

**Congressional skeptics still want to see** the specifics of these concessions before committing themselves to the program. So do most industry leaders. But, meantime, Congressional free-traders are encouraged by the reception afforded to the President's program so far.




# *Tips Its Head To Cut Production Corners*

Sawing 45° miters in any kind of material has always been a simple task for MARVEL Saws, but moving the work up automatically and making consecutive cuts on an angle was a problem, especially when the work was long and cumbersome.

This triple exposure photograph of a new MARVEL No. 81A All Hydraulic Heavy Duty Automatic Bar Feed Band Saw, illustrates how the upright head or column can be tipped 45° either right or left of vertical to make angle or miter cuts. The work is held stationary while the column, which carries the blade, is fed forward, meeting the work squarely to insure accurate cutting. After the cut is completed, the work is automatically moved up and measured, and another cut made.

Automatic miter cutting is just one of many exclusive universal features of these band saws. Designed to utilize every advantage of high speed steel band blades, MARVEL No. 81 Series Band Saws can handle almost any conceivable sawing job—from the smallest, most delicate work, up to 18" x 20" shapes.

Only the MARVEL No. 81 Band Saws have the "SURE-LINE" Automatic Accuracy Control (basic patent applied for) which literally steers a blade to make a straight cut. This unit extends usable blade life as much as 50%.

MARVEL No. 81 Series Band Saws are proving themselves daily, as the most versatile machine tools in production metalworking plants.

**For complete details, or a demonstration of MARVEL Sawing Equipment, write: Armstrong-Blum Manufacturing Co., 5700 W. Bloomingdale Ave., Chicago 39, Ill.**

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

# DETROIT...

## End of a wild year . . .

The best possible Christmas present Detroit and the auto industry could receive this or any other year is the current sparkling spurt in auto sales—and production—that's raising hopes for '62. On the heels of a poor spring and summer, the present solid market is all the more apparent and appreciated.

**Even though total passenger-car output** for the year will not be much over 5.5-million vehicles, the production rate in December has been at a rate that would result in nearly 8-million cars if it lasted through a whole year. Early in December the output rate was over 160,000 cars per week, enough to keep most everyone happy and busy.

**There's always a last-minute production rush** at the end of the year; Christmas sales spark some of it, but every manufacturer wants to run up as high a yearly total as possible. This accounts for the fact that, some years, more cars are produced in the factories than are actually registered to new owners—but over the years this must even out. This December, for example, Ford is running up to peak output at just shy of 50,000 assemblies completed in the first week in December. That's a total figure including some 19,000 Galaxies, 8800 Falcons, 8300 Fairlanes, 2700 Mercury Montereys, 2700 Meteors, 4000 Comets, 2400 T'birds, and 1100 Lincolns.

**Up to early December,** Chevrolet had not pushed too hard on the Chevrolet (29,500 per week), but was still raising production levels on the Chevy II (8500 that week) and also spurting the Corvair (6500). The BOP divisions have been running fairly steady; Pontiac at around 7000 per week (Tempest at 3000), Olds at 8000 (F-85 at 2000), and Buick at 6500 (Special at 3500 or more). Cadillac output is averaging 3800 per week.

**Chrysler's output is moderately steady,** at around 19,000 assemblies per week for the corporation. The most interesting change is that Dodge has recently passed Plymouth in assembly rate (at around 5000 per week). Chrysler and Imperial assembly rates are both up; Chrysler is one of the few car nameplates that will exceed last year's output this year. Lancer will beat last year's performance by a few thousand.

**Thunderbird will also look better** by a slight margin, and Lincoln is way up (total for the year will be around 33,000 Lincolns vs 19,000 for last year). Corvair has also improved its position, and the Buick Special is doing much better now—probably because of the V6 engine.

**Falcon will not beat last year,** but total Falcon output has topped a million vehicles, and the market split between full-size Ford Galaxies and Falcons—about 700,000 big ones vs 500,000 small ones—is readily apparent. Assuming Fairlane acceptance in early '62, the Fairlane-Falcon total should soon pass Galaxie output.

**Rambler is also pushing for a year-end peak,** with 11,000 assemblies per week early in December, up from a 10,000 average through the fall. Studebaker reached an output level over 3000 per week while the plant was filling dealer inventories, but has now levelled off at around 2500 per week.

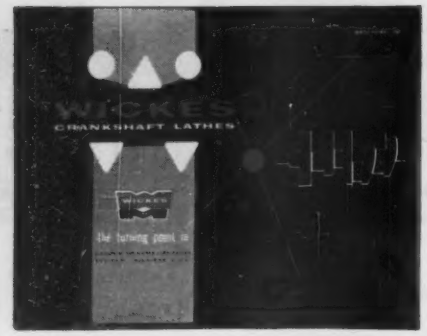
## Significant in '61 . . .

Probably the most important automotive development during the year—from the customer's point of view—has been the 30,000-mile lubrication interval. Though there was considerable engineering and development behind this advance, the net result in the car seems minor—some joint and fitting redesign, new seals, and a difference in lubricant. All this has had little effect on production, but it has had a strong effect on the reliability programs.

**From the producers' point of view,** '61 has had a remarkable effect on the product mix. All the bucket-seat options are one thing; but instead of one or two basic engines the manufacturer now has to have literally many tens of optional engine packages.

**Chrysler, Ford, and Chevrolet** each have two basic V8 engines, but Chevy says they actually have something like 60 different engine packages to turn out at their V8 engine plant in Flint, Mich. Ford does the same at its Rouge and Cleveland engine plants, and Chrysler the same at Trenton, Mich.

**The result for the manufacturer** is a lot of tooling and spread-out production, a lot of complications, and plenty of paper work. Tool and die shops around Detroit feel the effect in a recent surge in business. Machine-tool and other major-equipment producers don't feel the effect because major retooling programs are scarce this year. Ford's Cleveland plant was retooled for the 221-cu-in. V8 (for the Fairlane), Chevrolet did a lot of work to turn out the Chevy II 4's and 6's, and there was some hurried activity at Buick to convert V8 equipment to the V6, but really big programs seem to be out of style.




# IT TOOK WICKESmanship

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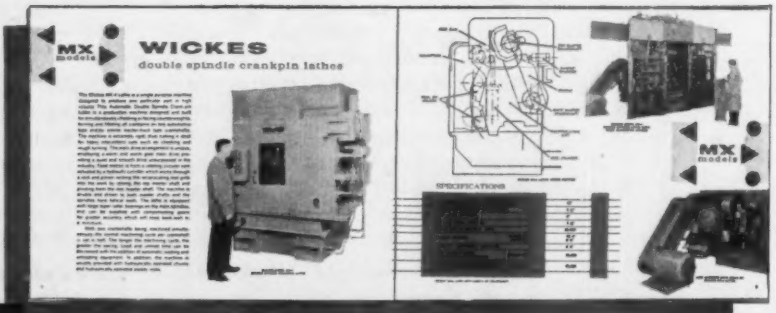


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*world's only specialist in*
*CRANKSHAFT TURNING*

# AIRCRAFT and MISSILES... TRENDS

## Defense budget to hit $51 billion . . .

The administration plans to ask Congress for about $51 billion in new obligational authority for defense in fiscal 1963.

**The Air Force is expected to get $21 billion;** Navy $15 billion; Army, $13 billion; Office of Secretary of Defense, $2.1 billion. Comparable figures for fiscal 1962 were $18.8 billion, $14.5 billion, $11.8 billion and $1.31 billion, respectively.

**Actual expenditures** for the current fiscal year should reach $47 billion and go over the $50 billion mark in each of the next five years. Included in the $51-billion defense request are funds for production of long lead-time items for the Army's Nike Zeus anti-missile missile.

**Almost all the increase** in the Air Force budget will go into tactical forces. There is no increase in funds for the Strategic Air Command. The Air Force will get money for development of medium-range ballistic missiles and the Army will be asked to take part in the development because of its experience in developing heavy vehicles for mobile missiles.

## A cut in Dyna-Soar funds ? . . .

New funds for the Dyna-Soar boost-glider may be under the $100 million requested for fiscal 1962, but a final decision has not yet been made. Defense Secretary McNamara recently said that the $85.8 million extra voted by Congress for Dyna-Soar would not be used. He considers the current level of funding to be sufficient.

**Ballistic missiles, naturally, are way up** on the priority list. Biggest increase is for the Air Force's Minuteman ICBM, which will be scheduled for about $2.1 billion. Navy's Polaris will stay at about $2.0 billion.

**Titan funds will be cut to $600 million** (from the current $1.3 billion). Request for the mobile Minuteman is $270 million; for the Skybolt air-launched ballistic missile, $325 million.

**The request for funds** for a conventionally powered aircraft carrier could very well be eliminated during the next session of Congress as a compromise move. Many Congressmen feel that if a carrier is to be built, it should be nuclear powered.

## Soviet defense budget hiked . . .

US intelligence experts are discounting the scope of Moscow's recently announced plan to boost Soviet defense spending in 1962 by about 44% over the original 1961 level. Washington believes the new increase—in real terms—is probably no more than 10%. The rest of the increase, US experts say, probably represents some massive reshuffling in Soviet budget bookkeeping.

**The Kremlin's defense budget** is a complex hodge-podge in which many costly defense programs are ordinarily lumped in with such civilian budget programs as financing the national economy and science. These civilian items have been reduced or have not risen as substantially as had been expected in the new budget.

**This leads US analysts to the conclusion** that the boost in Soviet defense spending plans is probably of the same magnitude as scheduled boosts in the US defense budget.

## No exotics needed here . . .

Douglas expects to meet the rigorous weight requirements for NASA's 11,500-lb Saturn S-4 stage without resorting to any exotic materials.

**The cylindrical tank section** is made of three half-inch-thick aluminum alloy sheets with internal, mechanically machined waffle stiffeners. Hemispherical closure domes are 0.25-in.-thick sheet formed of six wedge-shaped sections welded together (*AM/MM*—Jul 10 '61, p92). Chemical milling reduces the weight of these panels.

**The liquid-hydrogen tank will be insulated** internally. A bulkhead of 0.125-in.-sheet stock sandwich with a paper honeycomb core will separate hydrogen from liquid oxygen inside the tank.

## GD heads contractor list . . .

General Dynamics, with prime defense contracts totaling $1.92 billion, again led the Defense Department list of 100 top prime contractors for fiscal 1961. This makes it four out of the last five years for GD.

**North American, fifth in fiscal 1960,** jumped to second place with $1.2 billion in contracts. Lockheed, with $1.17 billion, was third, and Boeing was fourth with $920 million. The 100 leaders received awards totaling $17.3 billion—23% of which went for missiles and space projects, 20% for electronics, and 19% for aircraft.

***REMEMBER WHEN . . .***

# Sending A Boy To Do A Man's Job Was Disastrous?

It still is!

That's why Skinner Engine Company of Erie, Pa., put a new American 60 h.p. 40″ x 276″ J-6 lathe to work turning giant Banbury rotors for use in the world's largest rubber mixing machines.

Cast of 25-carbon steel and coated with hard rods up to 52 Rockwell C, these rotors weigh six tons and measure 18′-4″. Required accuracies are from 0.000″ to 0.003″ the entire length! According to Mr. J. LeGrand Skinner, President of Skinner Engine Company, use of their American lathe in turning these rotors results in substantial time savings . . . savings that stabilize current prices in the face of increased costs of prime stock.

To quote Mr. Joe W. Manson, Shop Superintendent at Skinner Engine, "The rigidity of this American Lathe, in addition to the rapid traverse of the cross slide and carriage, plus operator convenience, put this lathe in a class by itself".

Mr. Skinner and Mr. Manson have stated our case better than we could. Big or small, there's an American lathe that fits *your* job. Ask your American distributor for a demonstration.

American 60 h.p. 40″ x 276″ J-6 lathe turns giant Banbury rotor at Skinner Engine plant in Erie, Pa. Skinner Engine Company builds the world famous Skinner Marine Unaflow Steam Engine as well as huge mixers for raw rubber and other materials.

#12

**THE AMERICAN TOOL WORKS COMPANY**

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TRENDS

# MACHINE TOOLS...

## Ingersoll gets Vauxhall line . . .

Ingersoll Milling Machine Co has received an order from Vauxhall, British General Motors subsidiary, for a complete cylinder block line for its tooling program at its new Merseyside plant near Liverpool. As in the case of the two production lines for Opel, GM German subsidiary, ıor which it has contracted, Ingersoll will be responsible for the entire Vauxhall line and will purchase from other machine tool builders the equipment needed aside from Ingersol's own machines.

**Though deliveries of US machine tools** to European automobile companies will be very heavy in 1962, the buying programs that have been responsible for this business have been pretty well cleaned up. Some of the European auto makers, especially those in Britain, are not doing so well at the moment and the fear is that the industry has been expanding too fast.

**This means that new tooling programs** to be begun in 1962 are likely to be scarce compared with the activity the past year.

## US transfer machines preferred . . .

Uneasiness exists in US machine tool circles over the probability that with deliveries of European machines improving in the months ahead, builders here will not have nearly as much export business as they have enjoyed recently.

**There is good reason to believe**, however, that in the case of American car makers with European subsidiaries preference still will be given to US transfer and other high-production, automated machines.

**Though these machines will be installed** in European factories they are likely to be bought from American builders who will manufacture them here at home where close personal contact can be maintained between the car maker and the builder of the machines.

## Buying "to fill in the holes" . . .

No major tooling programs for US plants are hot just now. Ford probably will do some retooling at its Livonia, Mich, transmission factory to make 3 and 4 speed manual transmissions for the Galaxie 4-speed "hot-rod" model and perhaps for other Ford cars. But plans are not final.

**Some business for ordnance programs** has been placed by private contractors. Thompson Ramo Wooldridge, for one, has ordered machines for its M-14 rifle production.

**Much machine tool buying in 1962** apparently will be done to fill in the holes in production lines and to cut costs. This trend will be noticeable at Detroit as the public decides what car sizes it likes best and makers will be forced to add further capacity.

## Opposes tariff reduction . . .

Opposition to a reduction in the low 15% tariff on machine tools was recently expressed to a House Subcommittee in Washington in a statement by Francis J Trecker, president of the National Machine Tool Builders' Association, read in his absence by James Patton Jr, NMTBA counsel. Voicing NMTBA's sentiments, the statement says that federal funds should not be used for foreign-made machines, especially to acquire them at low foreign prices that are made possible by cheap foreign labor. "Buy American" policies should be amended to prevent this practice.

## Gray to buy King line . . .

Unless a last-minute hitch develops, G A Gray Co, Cincinnati, will acquire the line of King vertical boring mills from the Elmes & King Mfg Co, which in turn bought the line from American Steel Foundries. Gray is expected to move manufacture of King machines into its own Cincinnati plant and to sell them through its own distributors.

**What happens to King** has been the subject of all sorts of rumors around Cincinnati and throughout the trade. At one time recently an effort was made to get a group of machine tool distributors to buy control of King, but nothing came of it.

**Other deals**, like the Gray-King negotiations, are under way by builders who are seeking to diversify and consolidate their positions. One of these deals involves possible acquisition of a line of numerically-controlled machines by a builder already firmly established in the N/C field.

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# MATERIALS...

## Cheaper aluminum . . .

Extruders of aluminum doors, windows, trim, furniture, and similar items, got a 5% price break. Aluminum extrusion ingot sold by the nation's three largest producers was reduced 1.2 cents per pound, from 25.5 to 24.3 cents. Kaiser Aluminum and Chemical Corp, Oakland, California started the chain reaction. Promptly, Aluminum Company of America, Pittsburgh, and Reynolds Metals Company, Richmond, Va, said they would adjust their price accordingly. Aluminium Ltd, the Canadian producer, from its New York City office, said it would "remain competitive with US suppliers. Aluminium does a substantial extrusion-ingot business.

**Recent price cut is on top of the reduction** in the basic price of extrusion billets last September, when per-pound cost went from 27.2 cents to 25.5 cents. Thus, in three months the price has dropped more than 10%. However, the full benefit of the September reduction was diluted when, simultaneously, the no-toll allowance was dropped. (The latter is a special reduction given to extruders by aluminum producers when the latter does not have to buy back his customer's scrap.) The recent price reduction restores this allowance, hence actually is greater than 5%.

**Producers have been in a bind** for some time—and it has been getting worse. It is customary for an extruder to sell his scrap, which may be 30% of purchased weight, back to the primary producer at the ingot price less the cost of reconditioning the scrap to useable ingot. This procedure is far from profitable to the producer, who would like to concentrate on producing and selling aluminum.

**Some extruders even manage to make a dollar** or two extra by buying scrap on the market, cheaper than he is being paid for his excess metal, and reselling it to the producer. To offset this practice, which is not the producer's idea of sporting, Kaiser will buy back only up to 25% of the weight originally purchased.

**Why the price cut?** Some secondary smelters were selling extrusion billet at about one cent a pound under the prime price. Several industry spokesmen believe that the Kaiser move is a direct attack on this competition. Also, there is excess aluminum capacity available. Further price reductions may be forthcoming.

## 100% stainless muffler . . .

Promising to lick the annual $375-million muffler corrosion problem, a 100% stainless-steel auto muffler for the replacement market is being made by Hayes Industries, Inc, Jackson, Mich. Using a special stainless steel called MF-1, developed by Allegheny Ludlum Steel Corp, this muffler is only about one-half the size of today's conventional mufflers.

**A new technique deadens the engine's roar.** A stainless-steel spring operates on exhaust pressure to adjust the muffler for various driving conditions, hence provide maximum gasoline economy with minimum exhaust noise. The Jet-Flo muffler carries a lifetime warranty to the original owner as long as he owns the vehicle on which it is installed.

## New steel specs coming . . .

During the week of December 11, a special meeting of the American Institute of Steel Construction was held in New York City. Its purpose: To prepare the way for release, on January 11, of a new set of design rules for steel construction. The new rules, called the first major change since 1946, are only the second change since the first manual was issued in 1923. The revisions and additions, to take care of new alloys and design concepts, will be sweeping; will undoubtedly call for new building codes throughout the US.

**Improvements in structural steel,** in structural design, and in methods of connection (fastening) have occurred so rapidly that it has been impractical to review and revise the complete AISC Specification. Released in January will be data on design practices for A7, A373, and A242 steels as well as the new structural grade A36 and the new high-strength steels A440 and A441 are included.

**Data on plastic design, composite design,** thin-web plate girders, new column formulas and various improved connection methods are included.

"Bob, the computer analysis says we should buy those parts instead of making them"

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Precisionaire gages qualify parts and tolerances to tenths on as many as ten simultaneous dimension readings.

# This fleet of PRECISIONAIRE® gages...
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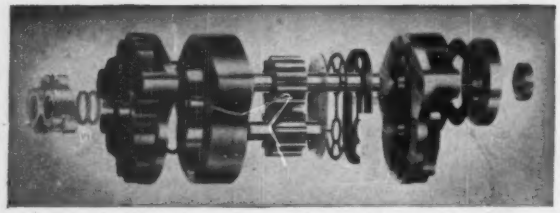

Six models of this Cessna hydraulic pump, used on farm and construction equipment, are gaged during production.

Honing machine operator checks valve body bore at 9 points at once, determines .0001" classifications.

"Without the proper type and quantity of gaging equipment, we never would have been able to produce such high quality hydraulic pumps, valves, and cylinders at such low relative costs," reports the Industrial Products Division of Cessna Aircraft Company.

Knowing that bad pumps correlate with lack of gaging equipment, Cessna has a complete set of gages for each model pump, ready to roll to the machines for quick setup and start of production. Thirty-five rolling gage cabinets, carrying more than 400 Precisionaire columns, are used in the production of these pumps.

All pump parts are produced to be completely interchangeable—there is no classifying or selective fitting. This results in minimum investment in parts inventory, a very rapid rate of assembly, and practically no reworks.

Interchangeable parts greatly simplify replacement problems. Inventory is at an irreducible minimum, service problems are negligible, and users are happy with the minimum maintenance and maximum performance of the pumps.

Write for The Cessna Story and Precisionaire Catalog SPG-160. The Sheffield Corporation, Dayton 1, Ohio.

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# WHAT'S AHEAD... in Metalworking

TRENDS

## Production holding at peak levels . . .

Metalworking production, already rolling along at peacetime peak levels, shows signs of forging ahead even further as 1961 bows out.

**Steel producers report pickups** all across their product lines, with hot and cold rolled sheet showing the greatest increase. An increase in orders at this time of year is against the usual seasonal trend, and most producers attribute the rise to hedge buying and inventory buildup.

**Steel orders coming from the appliance** and auto industries are said to be good for this time of the year.

**Electrical machinery manufacturers** report that they are closing out the year with near record backlogs, but that profits are continuing to shrink. Consensus is that 1962 will be a good, if somewhat less than sensational, year.

**Metalworking job shops** present a mixed picture. Some shops, finishing strong after a slow start this year, report that demand is heavy and backlogs are high. Other shops say that there is little if any backlog. Though the pickup registered in October has pulled them up enough to match 1960 levels, these shops report that activity is not sustained. They do, however, anticipate a sustained upturn around mid-March.

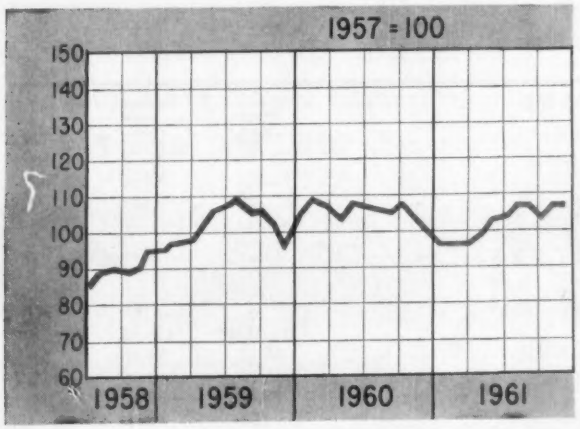
**Bearing manufacturers** are closing out the year on a good note: Business was up from 5 to 15% over 1960 and increased defense spending should add more business. Most of the increased business this year was in specialty areas. Current backlogs seems to be about evenly distributed between industry and consumer goods.

**Welding shops report a good level of activity** and a steady volume of new business. The pickup that began early this fall should carry these shops to about 10% better levels than in 1960. Current orders are coming from foundries and machine tool builders, and activity is expected to contiunue well into 1962.

**Sheetmetal shops** have made a strong comeback from the recent recession. They were among the hardest hit industries, but they go into 1962 with strong, steady business.

**Commercial heat treaters** indicate that business is slow and that orders aren't coming in any better than they were earlier this year. One spokesman feels that a major cause could be the lack of new automotive tooling this year. Business is off as much as 10% this year for some heat treaters, especially those tied closely to auto industry. More diversified shops are in better condition.

**Shipments of industrial fasteners** declined two points on the Industrial Fasteners Institute's shipments index for the most recent month. The index now stands at 92 (1956-58=100), but this is ten points higher than the corresponding month in 1960.

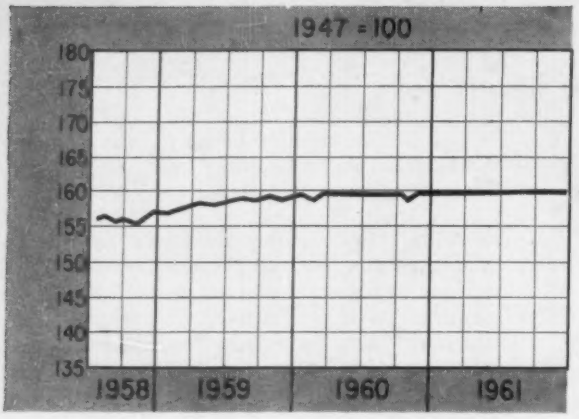



**AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION**

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

| | NOV Estimated | OCT Preliminary | SEPT Revised | OCT Year Ago |
|---|---|---|---|---|
| **Total Index** | **108** | **108** | **104** | **104** |
| **Machinery** | | **103** | **102** | **100** |
| **Electrical Machinery** | | **119** | **118** | **107** |
| **Autos** | | **111** | **95** | **119** |
| **Other Transportation** | | **95** | **93** | **90** |
| **Other Metalworking** | | **113** | **109** | **109** |

# TRENDS WHAT'S AHEAD... in Business




**159.3** Total Index

**AMERICAN MACHINIST INDEX OF METALWORKING PRICES**

| | NOV Estimated | OCT Preliminary | SEPT Revised | OCT Year Ago |
|---|---|---|---|---|
| **Total Index** | **159.3** | **159.4** | **159.4** | **159.4** |
| **Metalworking Machinery** | **195.3** | **194.5** | | **193.3** |
| **Other Machinery exc. Electrical** | **174.0** | **174.2** | | **173.3** |
| **Electrical Machinery** | **156.9** | **156.6** | | **158.7** |
| **Fabricated Metal Products** | **147.0** | **147.0** | | **147.4** |

## Balance of payments problem threatens . . .

Welcome as a rise in business is, it tends to bring with it an international headache. That old balance of payments, with its hint of foreign operatives dealing darkly in precious metals, is acting up again.

**United States sales of goods to foreigners** are largely dependent on business conditions overseas. For the past few years, those conditions have been quite stable in the major export markets, so our exports have been relatively stable, too. There has, of course, been a little growth in exports, and demand for individual products has fluctuated all over the lot. But as a total, merchandise exports have been steady.

**The import picture is just the opposite.** Our purchases of products and services from abroad are determined largely by incomes. Those incomes were knocked into a cocked hat during the recent recession, and our imports dropped during the autumn of 1960. The result was an improvement in our payments situation.

**Now, just the opposite is happening.** Business is perking along at a bouncy pace and headed higher, incomes have rebounded sharply from their dismal days last winter, and consumers are flocking with renewed vigor to the retail marts. And some of the things consumers are buying are imported. Since January, merchandise imports for domestic consumption have risen about 20%.

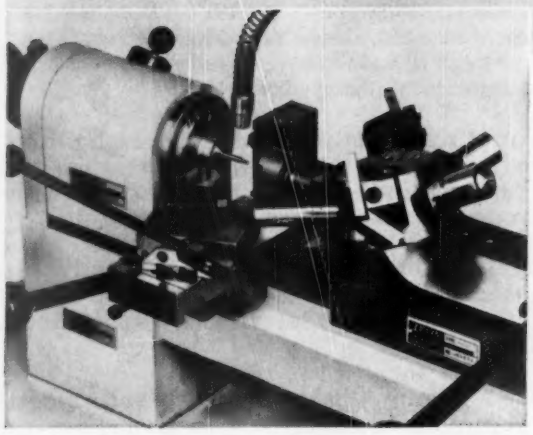
**On top of the private transactions** affecting international payments come government transactions. It seems likely from the general climate existing in international affairs that these payments will swell during 1962. Growing federal payments, added to rising imports, mean we will have to keep a close watch on how much money is flowing in and out of our country. If drains threaten the dollar we could ultimately be forced to devalue the dollar, impose import restrictions, trim foreign aid, or a combination of all three.

| ***WEEKLY BUSINESS INDICATORS*** | *Latest Week* | *Preceding Week* | *Year Ago* |
|---|---|---|---|
| *Business Week* Index of Activity (1947-1949=100)* | 163.5 | 163.3 | 144.8 |
| Steel ingot operation (thousands of tons) | 2,158 | 2,073 | 1,396 |
| Electric power output (million Kilowatt hours) | 16,084 | 15,954 | 15,013 |
| Production of automobiles | 161,700 | 164,834 | 135,328 |
| Engineering construction awards (*Eng. News-Record*—thousands) | $63,693 | $69,788 | $75,886 |

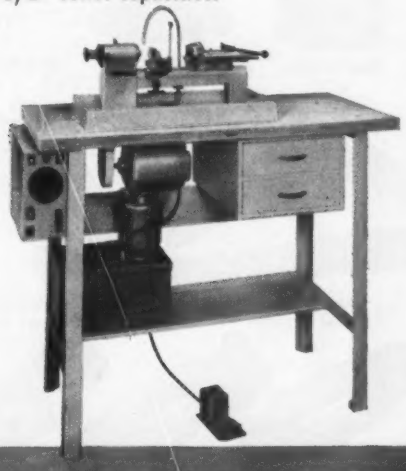
| ***MONTHLY BUSINESS INDICATORS*** | *Latest Month* | *Preceding Month* | *Year Ago* |
|---|---|---|---|
| Index of indusrtial production (1957=100)* | 113 | 112 | 106 |
| Index of durable manufactures production (1957=100)* | 108 | 106 | 101 |
| Durable goods manufacturers' sales, billions* | $15.34 | $14.98 | $14.08 |
| Machinery manufacturers' sales, billions* | $5.11 | $4.98 | $4.59 |
| Durable goods manufacturers' new orders, billions | $16.12 | $15.76 | $13.74 |
| Machinery manufacturers' new orders, billions | $5.46 | $5.42 | $4.40 |
| New Orders for Nonelectrical Machinery (1950=100)* | 196 | 193 | 166 |
| New Contracts for Industrial Construction (1950=100)* | 130 | 105 | 192 |

* Seasonally adjusted

# SMALL PART PROBLEMS ?



**LEVIN** Heavy duty instrument lathes offer the best solution to small part lathe operations. 29 standard models for first and second operation work in 3/16", 5/16", and 1/2" collet capacities.



Shown above, an ACAF turret lathe set up to produce the small needle valve, illustrated, with a 0.0118" bleed hole. The self indexing turret is extremely sensitive for fine work. Speed regulation is continuously variable from 0 to 4000 r.p.m. with IR drop compensation.

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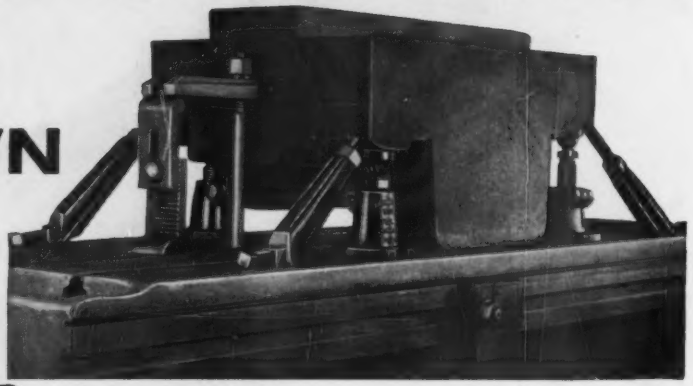
# ARMSTRONG

## SET-UP *and* HOLD-DOWN TOOLS



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ARMSTRONG "T" SLOT BOLT

ARMSTRONG "T" SLOT NUTS

ARMSTRONG NUTS

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Whatever its shape, a work piece can be quickly, easily and safely set up on any T-slotted table with ARMSTRONG Set-up Tools. Comprising a complete "system" of supporting and holding devices in all essential sizes, ARMSTRONG Set-up Tools usually pay for themselves on the first job and continue to lower costs for years to come.

**Save Time:** Keep costly machines and high priced men producing—save time otherwise lost while operators rummage in the scrap box for materials with which to devise makeshift set-up methods.

**Prevent Breakage and Spoilage**—correctly designed, machined from special steels or drop forged and heat treated, they are extremely stiff, strong and reliable.

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# Not a Pool Shark But a Hustler

Metalworking faces the New Year with good cheer. And why shouldn't it? The recession of 1960-61 is retreating farther into the background all the time and a new upsurge in business has replaced it.

As one looks ahead, a period of expanded operations looms. It is a good bet that, barring war, 1962 will go down as one of Metalworking's better years, with the total volume of production coming close to, if not setting, a new record.

**This may sound like . . .**
tall talk. But two of the stalwarts—steel and automobiles—appear slated for important performances during the first half. Steel, to be sure, will be buoyed to some extent by stockpiling by customers in anticipation of a strike, with the second half feeling the effects. But despite this imbalance, steel is in for a good year.

Though 1962 will be no 1955 (when car production went through the roof), Detroit feels that it will be one of the better years. Moreover, Detroit is ready for it. And a multitude of satellite industries will benefit.

**On top of these two stalwarts . . .**
the defense industries will be operating at a high rate. What with all the aerospace programs added to the build-up of conventional weapons, 1962 style, the metalworking industry will have more business stemming from national defense than in a long time.

Even better for the economic health of the nation, consumers seem to be in a mood to buy. The most recent Federal Reserve Board survey confirms this fact. This buying mood extends to all sorts of goods. And it has been convincingly demonstrated in the pre-Christmas rush.

Most impressive of all is the upturn in capital goods demand. The coming year gives promise of an important expansion in ordering of heavy goods of all kinds, a prediction supported by forecasts of machinery manufacturers in various lines.

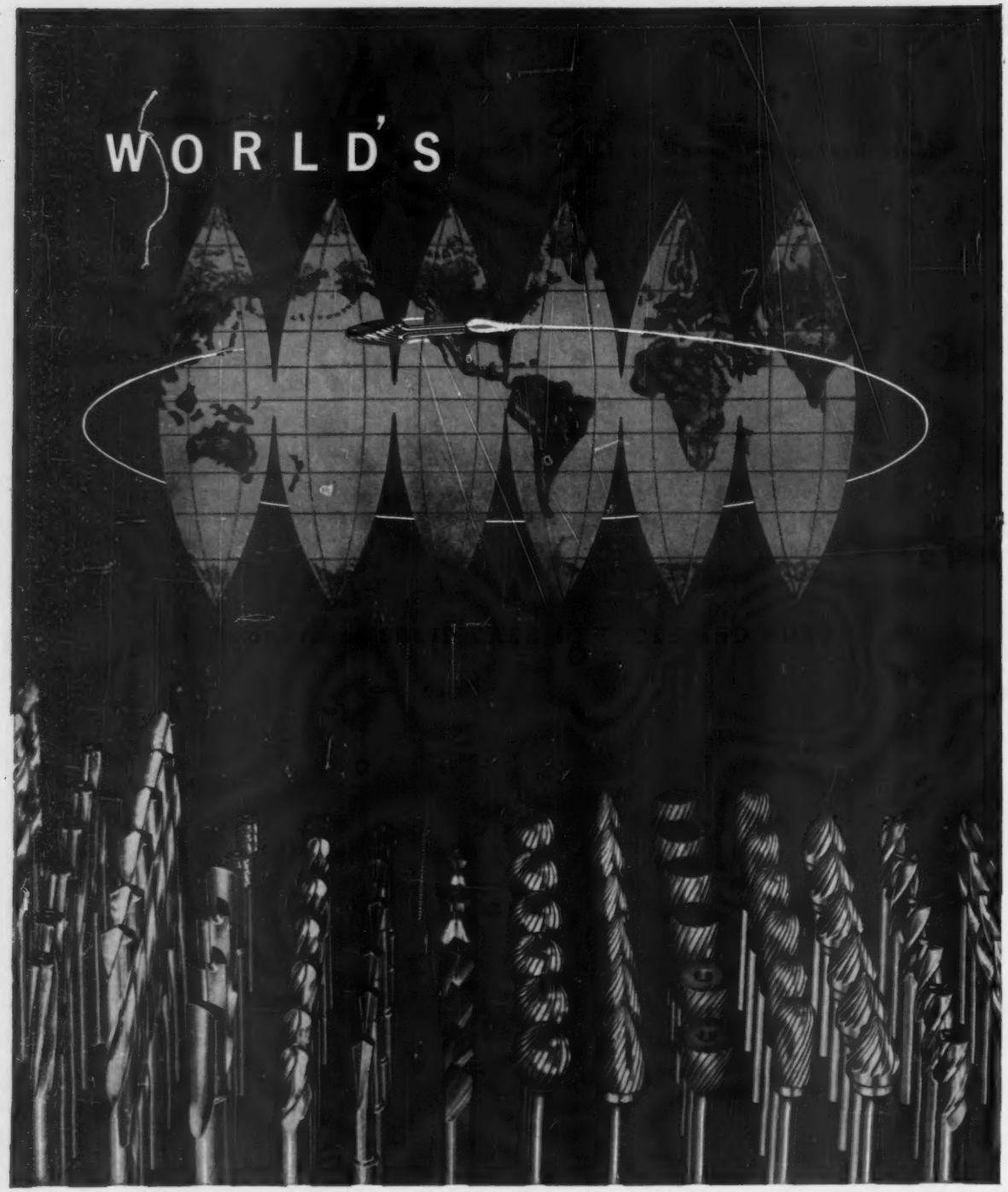
But let's be frank about it. The next twelve months will be no joy ride. Nineteen sixty-two promises to be a near-record-breaking year for Metalworking and for the national economy as a whole. At the same time competition may well be the toughest in history.

Make up your mind that you are not going to have a large volume of business and make a satisfactory profit margin without knowing that you have been through a rough time. For industry still has too much capacity in almost any product you may wish to name. And many people will be after the same order that you seek.

**If you are to get the volume . . .**
that you want and need to participate fully in the upturn, you must begin with certain essentials: 1) a well-designed up-to-date product; 2) a manufacturing setup that can produce your product at a low cost so that it can be priced right and still return a good profit; and 3) an intelligent, enthusiastic and hard-hitting sales organization.

Yes, 1962 looks good. It will present plenty of problems, from what to do to compete against and inside the Common Market down to local taxes and fringe benefits. But along with all the problems will go a really big volume of business. Whether you secure your share is likely to depend in large measure on whether you are a pool shark or a hustler.

Burnham Finney EDITOR

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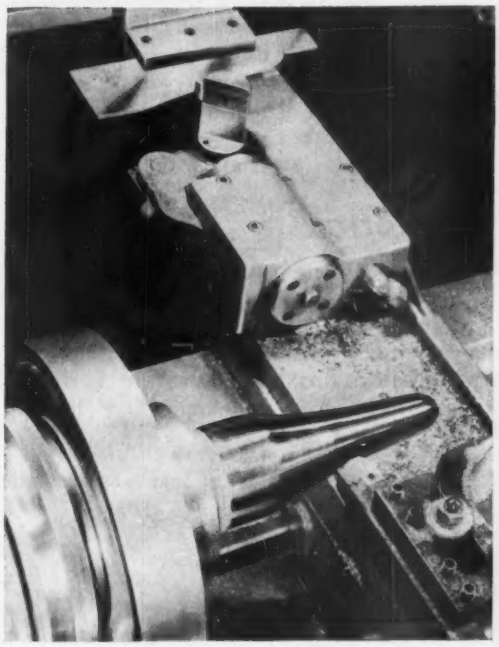
VOL 105, NO 26 **American Machinist** / *Metalworking Manufacturing* DECEMBER 25, 1961

*When the work diameter varies,*
*For better turning and facing*

# Keep cutting speeds uniform!

**Greater productivity, longer tool life, better surface finish—all these can be achieved in turning or facing parts of varying diameter by switching to adjustable-speed drives, which keep surface cutting speed constant**

By James N Colebrook, Lodge & Shipley Co, Cincinnati



**Surface cutting speeds** were held constant on this CI mold plunger, coated with Colmonoy to a hardness of Rh 50-55C. A 4:1 adjustable-speed drive machined the part in one-tenth the time required for a constant-speed drive. Table on next page gives machining data on this part for three types of drive

When the workpiece diameter changes constantly, as in turning a cone or facing a disk, the surface cutting speed should be constant.

In turning and facing operations, this ideal of uniform cutting speeds has long been recognized. But until recently it has not received much attention, except in special applications like the machining of compressor disks for jet engines.

This attitude is changing. Uniform cutting speeds are almost mandatory for this kind of work, especially when the material is a hard-to-machine superalloy or a refractory metal, and when the cutting tool is ceramic or a harder carbide.

Constant surface cutting speeds become essential if precision parts (like the one pictured above) are to be machined to fine finishes. Contrast this with the usual technique of adjusting the spindle speed in steps, either manually or automatically, to get an approximation of the desired cutting speed. No matter how fine the steps, tool marks almost always are left on the machined surface, at each point where the speed changes. This happens whether or not the spindle is stopped for each speed change.

There are two other advantages in being able to hold uniform speeds: For most form turning and facing work, spindle drives of infinitely adjustable speed, controlled automatically to assure a constant cutting speed at the tool tip, can materially reduce the time required for a given cut. Furthermore, tool life improves.

### Machining time halved

The following example shows just how sharply machining time can be slashed when the cutting speed across the work surface is held constant, where the diameter varies:

Assume that a 20-in.-dia faceplate, with a 1-in.-dia hole in the center, is to be faced from the periphery down to the inner hole. For the example, let us assume that cutting speed is 400 fpm, feed rate is 0.010 ipr, and depth of cut is ⅛ in.

To achieve 400-fpm cutting speed at the periphery of the part, spindle speed must be 76.5 rpm. With a conventional lathe, this spindle speed would not change as the tool traverses the entire surface of the part during the facing cut. But the surface cutting speed would vary, because the work diameter changes constantly.

The total cross slide and tool motion necessary to face from the 20-in. diameter down to the 1-in. hole is 9½ in. To get the time for this cut, we divide this distance traveled (9½ in.) by the product of the spindle speed (76.5 rpm) and the feed rate (0.010 ipr). The answer here is 12.42 minutes.

*Keep cutting speeds uniform*

## Tracer-Turning a Hard-Coated Cl Plunger

| Machining Data for 90° Tracer Lathe | Drive to Spindle Constant-Speed | 4:1 Adjustable-Speed Drive to Spindle | 10:1 Adjustable-Speed Drive to Spindle |
|---|---|---|---|
| Type of Tool Bit | Tungsten Carbide | Ceramic | Ceramic |
| Spindle Speed — RPM | 166 | 456 to 1824 | 450 to 3000 |
| Cutting Speed — FPM | 0 to 174 | 470 | 470 |
| Number of Cuts | 3 | 2 | 2 |
| Depths of Cuts — In. | 0.020, 0.020, 0.015 | 0.040, 0.015 | 0.040, 0.015 |
| Feed Rates — IPR | 0.0045 | 0.045, 0.006 | 0.045, 0.006 |
| Total Time — Min. | 31.62 | 3.68 | 3.32 |
| Percent of Time Saved | — | 88% | 89.5% |
| Tool Life — Cuts per Edge | 1 | 2 | 2 |
| Surface Quality | 250 to 63 mu-in. from axis to periphery | 16 mu-in. over 86% of surface | 16 mu-in. over 94% of surface |

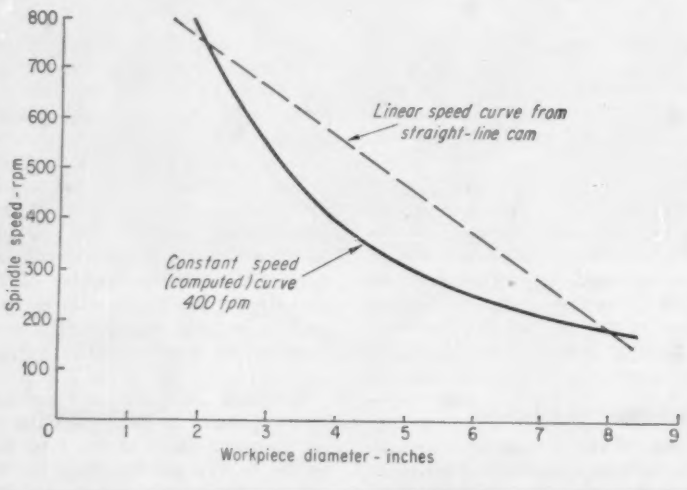
**Adjustable-speed drives** take about one-tenth the time to do a job in which the work diameter changes constantly, compared to constant-speed drive. Other advantages: better tool life and surface finish

## Deviations from Constant Surface Cutting Speed

(Straight-Line Cam Control)

| Diameter of Workpiece | Percentage of Cam Length | Spindle Speed RPM | Cutting Speed FPM | Percent Deviation |
|---|---|---|---|---|
| 8 | 0 | 191 | 400 | 0 |
| 6½ | 25 | 334 | 567 | 42 |
| 5 | 50 | 477 | 622 | 56 |
| 3½ | 75 | 620 | 570 | 42 |
| 2 | 100 | 764 | 400 | 0 |

NOTE: Assume that an 8-in.-dia disk is to be faced from the periphery down to a 2-in.-dia hole. Depth of cut is ⅛ in. Desired constant cutting speed: 400 fpm. Here a straight-line cam controls a 4:1 adjustable-speed drive, to give 400-fpm cutting speed both at the periphery and at the hole in the center.




**Straight-line cam** provides automatic control, but it only approximates a constant surface cutting speed. If the cutting speed is held constant, relationship of spindle speed to work diameter is hyperbolic. As the graph shows, there is considerable deviation from this hyperbola when a straight-line cam controls machining

If the spindle of this lathe were powered by an infinitely adjustable speed drive, with a 4:1 range controlled automatically, the total cutting time would be quite different: only 6.78 minutes. Compared to the first method, the time savings would be 45.5%.

To get this time, we solve the following formula:

$$T = \frac{(D^2 - d^2)\ \pi}{F \times 48 \times S}$$

where $T$ = time in minutes, $D$ = large diameter in inches, $d$ = small diameter in inches, $F$ = feed in inches per revolution, and $S$ = surface speed in feet per minute.

With the adjustable-speed drive, of course, spindle speed automatically is varied to keep surface cutting speed uniform. Because we are using a 4:1 adjustable-speed drive in the example, we must compute the time in two steps: (1) We compute with the above formula the time required to take a facing cut from the 20-in. OD down to a 5-in. diameter. The answer is 6.13 minutes. (2) We compute the time needed to complete the cut, which must be taken at the highest spindle speed provided by the time 4:1 adjustable-speed drive (4 times 76.5, or 306 rpm). The solution here, found by dividing the remaining distance (2 in.) by the product of the feed rate (0.01 ipr) and the spindle speed (306 rpm), is 0.65 minutes. Total time for this cut, then, is 6.78 minutes.

If the lathe were equipped with a 20:1 infinitely adjustable speed drive, the above formula would apply over the entire cutting distance. Then the total cutting time would

be only 6.52 minutes, or 47.5% less than what is required with a constant-speed drive to the spindle.

From these examples, we can see that, by increasing the drive range from 4:1 to 20:1, we gain a time saving of only 2%. Clearly, the simpler 4:1 drive gives roughly the same time savings as the more expensive 20:1 drive. Thus, unless the goal is the best surface finish possible, the 4:1 drive gives roughly the same productivity as the 20:1.

### Savings in turning

Adjustable-speed drives bring the same time savings in the turning of parts, such as the contoured plunger that is reproduced at the beginning of this story. Table at left summarizes results of three separate machining operations on the plunger, a cast-iron part hard-surfaced with Colmonoy to Rh 50-55C. The job here was to finish-turn to a templet-controlled contour with a single-point toolbit:

**Constant-speed drive:** With a conventional tungsten-carbide-tip bit in a clamp-type holder, and with the lathe spindle turning at a constant 166 rpm, the cutting speed ranged from 0 to 174 fpm. To finish the job, three cuts were necessary—at depths of 0.020, 0.020, and 0.015 in. In each case, the feed rate was 0.0045 ipr. Total time for this job, as the table shows, was 31.62 minutes, and surface finish was 63 to 250 micro-in.

**4:1 adjustable-speed drive:** With a ceramic insert in the clamp holder, spindle speed was automatically adjusted between 1824 rpm at the workpiece nose and 456 rpm at the largest diameter, to achieve a constant cutting speed of 470 fpm over most of the surface.

Under these conditions, only two cuts were necessary: a roughing cut taken at 0.040-in. depth and 0.045-ipr feed; and a finishing cut at a depth of 0.015 in. and a feed of 0.006 ipr. The total time for these cuts was 3.68 minutes, or only 12% of the time it took with a constant-speed drive. And surface quality averaged 16 micro-in. over 86% of the workpiece surface.

**10:1 adjustable-speed drive:** With this drive, the desired constant cutting speed of 470 fpm could be held over the entire surface of the workpiece. The same cuts as with the 4:1 drive reduced total cutting time to 3.32 minutes: a saving of 89.5% over the constant-speed setup, but only 1.5% over the 4:1 adjustable-speed drive. Here, however, a surface quality of 16 micro-in. was obtained over 94% of the workpiece surface.

This improvement in surface quality could, in many instances, tip the scales in favor of the more expensive 10:1 adjustable-speed drive.

### Need for controls

For many operations we must coordinate tool performance, surface-finish requirements, productivity, and other factors. All these problems with varying-diameter parts call for constant, automatic control of cutting speed as the only practical solution.

There is a definite relationship between spindle speed and workpiece diameter, which we can express in the following statements: If the surface cutting speed is held constant, spindle speed approaches zero as we increase diameter; conversely, speed approaches infinity as the diameter is reduced to zero. Graphically, we can express this relationship of speed to diameter as a hyperbolic curve. Because neither infinity nor zero is practical, we must establish limits that are within the physical capabilities of the machine, its drive, the cutting tool, and the workpiece.

One way to set these limits is with manual controls. Here we can set definite limits on cutting-speed deviation and compute diameters where these limits will be exceeded. At each of these diameters, we can stop the lathe, select the appropriate spindle speed, and resume the cut. But this practice not only is time-consuming and inaccurate, but leads inevitably to poor surface finish and low tool life.

A better approach is to select an adjustable-speed drive, with a suitable speed range, that can be arranged for manual control. With this setup, the operator arbitrarily can change the spindle speed at any point he deems appropriate. Often this arrangement is adequate, but even though it can bring big time savings and increased tool life, it depends on the operator's skill.

### Automatic controls—approximate

To relieve the operator of the task of manipulating manual controls, we can introduce a simple straight-line cam, which the lathe cross slide drives directly. This cam actuates some mechanism, rheostat, or potentiometer that has a linear output. The effect here is to make the motor speed up gradually as the tool approaches the center of a workpiece being faced. Such an arrangement gives, however, only an approximate speed control, because it provides a linear rather than a hyperbolic ratio of spindle speed to workpiece diameter.

Because the cam is straight and the controlling mechanism is linear, spindle speed will vary directly with the cam's movement. In other words, with a 4:1 adjustable-speed drive the speed will have doubled when cross-slide travel is 50% of the cam's length.

With this arrangement, we can calculate spindle speeds at various points of tool travel across the workpiece. Representative values for a typical example appear in the table on p58, together with a graph that compares the straight-line relationship provided by the cam with the hyperbolic curve that represents constant surface cutting speed.

In this example, the straight-line cam obviously gives little or no advantage. As the graph shows, there is considerable deviation from a constant cutting speed in all but the start and finish sections of the job. In fact, the operator could probably do a more efficient job with manual controls.

### Automatic control—practice

The straight-line cam described above gives only an approximation of accurate automatic control. But once we have a linear controller of known travel, and we know the speed range of the drive, we can compute the change in spindle speed required for each motion of the controlling mechanism.

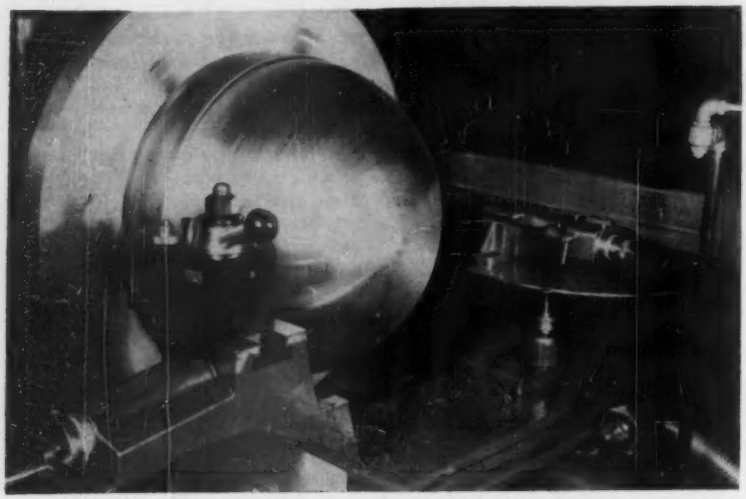
With this information, we can design a cam that will move the linear controller the required amount for any given cross-slide travel (which, in turn, represents a known change in the workpiece diameter).

Such a cam is suitable only for a workpiece whose maximum and minimum diameters are those in the calculation. For each range of diameters, one has to make a separate cam. Although we now have a sophisticated control, the diameter range is restricted.

To overcome this limitation, we can shift the range of a given cam by putting a gearbox between the cam output and the linear controller.

In the example just discussed—facing from an 8-in. down to a 2-in. diameter—the cross slide and tool actually move only half the difference between the diameters, or 3 inches. In this 3 inches we must make use of the 4:1 adjustable-speed drive's full speed range.

## *Keep cutting speeds uniform!...*



**45° tracer** and a carriage-mounted potentiometer control this adjustable-speed setup. A linear signal goes to a constant-cutting-speed amplifier, which regulates the drive in the necessary hyperbolic relationship between spindle speed and workpiece diameter. Ceramic toolbits give a 32 micro-in. finish over this 26-in.-dia hemisphere

Assume that we wish to make this 4:1 change over a 16-in. to a 4-in.-dia range. To do this, we must modify the motion output from the cam to the controller, extending the total movement over a 6-in. range of tool travel instead of the 3-in. range for which the cam is designed. The gearbox enables us to do this.

It will also be necessary to shift the cam in relation to the controller, so that it is referenced to a 16-in. diameter when the tool is located at this maximum diameter. Obviously, gear ratios could be worked out for a variety of maximum and minimum diameter ranges that encompass the speed range available with the adjustable-speed drive.

### Greater speed range

An alternate setup would be to use an adjustable-speed drive with a range greater than 4:1. Drives are available with ratios from 2:1 to 24:1, the latter being especially desirable when close control of surface finish over a wide diameter range is necessary.

Paradoxically, productivity with the 4:1 drive is practically the same as with a greater speed range. From the largest diameter down to about 25% of this diameter, the speed range is of relatively minor importance, compared to the change from 25% down to zero. But the wider range, although it involves a greater initial investment, may prove more economical in the long run—especially if several sizes of cams have to be made, or the gearbox alternative must be used. These latter setups also require, of course, time and effort to change over each job.

### Electronic speed amplifiers

Thanks to improvements in electronic controls, the task of maintaining constant cutting speeds over a range of diameters has been simplified. But these controls are somewhat more expensive.

Electronic controls eliminate the cam. Here an electronic amplifier, built into the drive, provides the non-linear relationship between tool motion and speed control. At present this efficient, highly accurate arrangement represents the ultimate in constant cutting speed control.

The picture above shows a tracer-controlled spherical turning operation. Equipped with a 45° tracer, the lathe also has a carriage-mounted potentiometer, which provides a linear signal to a special constant-cutting speed amplifier. This unit regulates the spindle speed, to give it the necessary hyperbolic relationship with the position of the cutting tool. Such a setup holds surface cutting speed constant within a tolerance of ±1% from a 26-in. OD to within 1¼-in. diameter from the workpiece centerline. It maintains a finish of better than 32 micro-in. over the work's entire surface—an almost impossible task with any other arrangement.

### Tracer lathe work

Because so much of today's turning is tracer-controlled, we should evaluate tracer turning in terms of constant surface speeds.

As the name implies, the 90° tracer always moves the cross slide and the tool perpendicular to the workpiece centerline.

Again, a constant-cutting-speed cam can be moved in direct relation with the movement of the tool, and the application is identical. For example, if we have a two-foot-long, cone-shaped workpiece that starts at a 2-in. diameter and increases to an 8-in. diameter, we can maintain constant cutting speed over the entire periphery, because only the cross-slide motion is controlling the speed.

With the 45° tracer lathe, an additional factor comes into play, which is reflected in the relationship of tool movement to 45° tracer-slide travel. In this application, the cross-slide normally remains stationary. As the carriage proceeds toward the headstock, the tracer slide moves away from the work at a 45° angle, in response to the stylus control from the templet.

As the 45° slide moves, the relative change in diameter, with respect to the tool, is not equivalent to the total slide movement. Simple trigonometry shows us that, if the tracer slide moves 1 in. on a 45° angle, the corresponding motion of the tool perpendicular to the spindle axis is only 0.707 in. We must compensate for this difference because, to be accurate, constant cutting speed must be defined in terms of tool movement only.

Assuming that we are driving the cam by cross slide only, it is evident that no speed change will occur when the 45° slide moves, because the cross slide remains stationary. Therefore we must connect through some suitable linkage the motion of the 45° slide to the cam. This requires that the cam move independently of the cross slide, reflecting motion of the 45° slide only. Too, the relationship between the 45° slide motion and the cam motion must be in a ratio of 1 to 0.707. In other words, for every 1 in. of 45° slide motion, the cam must move 0.707 in.

The 45° tracer lathe has the added facility of being able to do contour facing in which the carriage is stationary and only the cross slide moves. By maintaining a ratio of 1 to 0.707 between the amount the cam is moved by the cross slide and the amount it is moved by the tracer slide, we can maintain a constant speed, regardless of which slide moves the cam. •

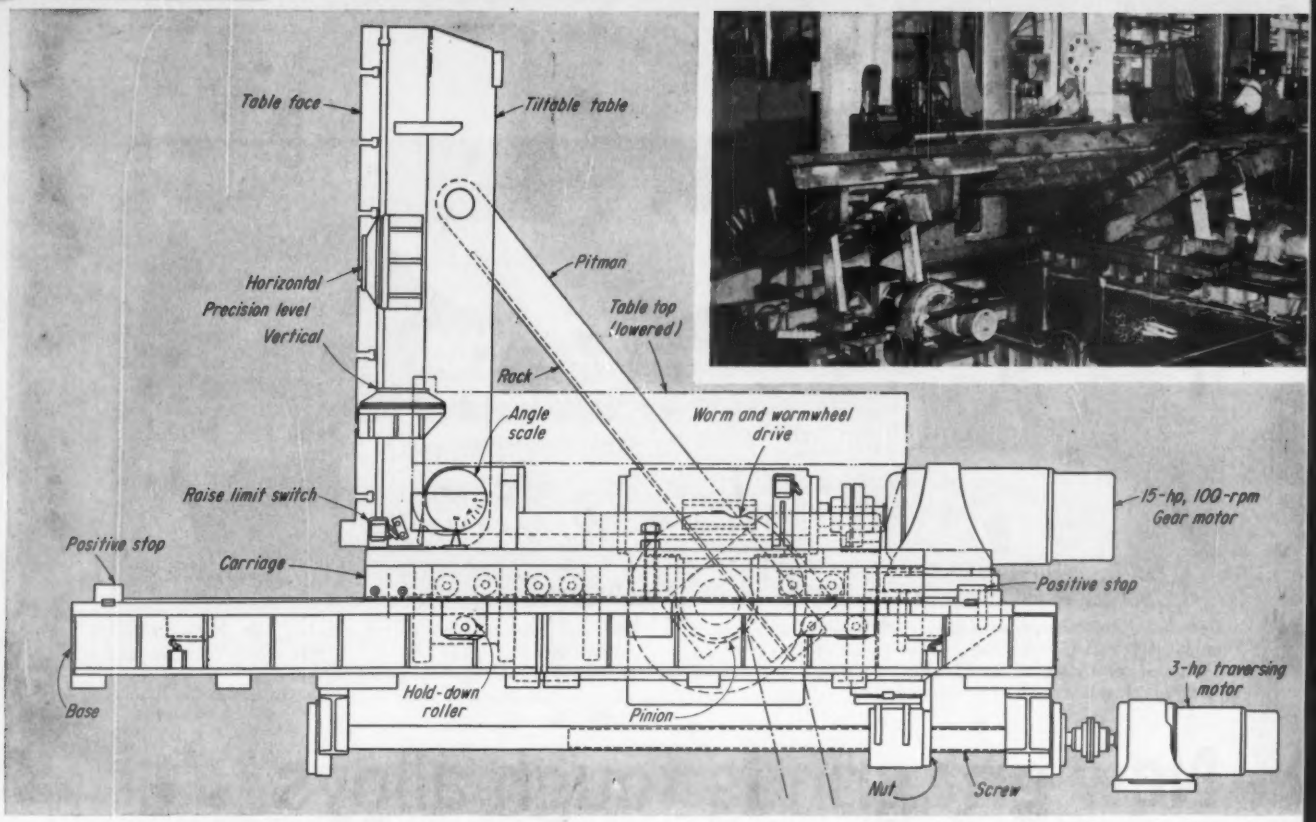



**Table of each tilt-up fixture** is supported with two heavy-steel pitmans, large steel pinions, and a massive worm and worm-gear drive when it is raised above its normal horizontal position. Worm is driven at 100 rpm by 15 hp motor. Carriage supporting table can be moved five feet along base ways with motor-driven traversing screw

# Tilt-up fixtures for N/C drilling

By Raymond Hoss
Superintendent, Methods Dept
Ingersoll Milling Machine Co
Rockford, Ill

**A pair of tilt-up fixtures has been teamed up with a pair of numerically controlled drilling machines to position and machine castings up to 9 feet wide, 25 feet long, and weighing as much as 40 tons.**

**As a result, such large parts can, when necessary, be drilled, reamed and tapped from all six sides in only two settings.**

Up to now, positioning of such multi-ton castings to scribe hole locations for drilling has been a time-consuming job requiring a skilled man to lay out each part manually. In some cases, holes drilled in one of two mating parts had to be used as guides for scribing hole locations in its mate. Result: an operational bottleneck and constant rework.

At Ingersoll, the drilling is done by a pair of horizontal, single-spindle, traveling-column Carlton drilling machines—numerically controlled. The machines are arranged at right angles to a drilling group that includes two Ingersoll-designed 84 x 84-in. tilt-up fixtures.

Together, the fixtures can handle castings as large as 9 feet wide and 25 feet long, and weighing 40 tons. Separately, each can handle parts as large as 9 feet wide, 10 feet long, and weighing 20 tons.

## Any angle to 90°

These tilt-up tables are positioned with manually controlled 15-hp motors—so that the work can be accurately positioned and supported at any required angle from 0 to 90° from the horizontal.

Each of the two horizontal Carlton spindles can be positioned, numerically and automatically, anywhere wtihin the available horizontal travel of its column—25 feet in one case, 35 feet in the other.

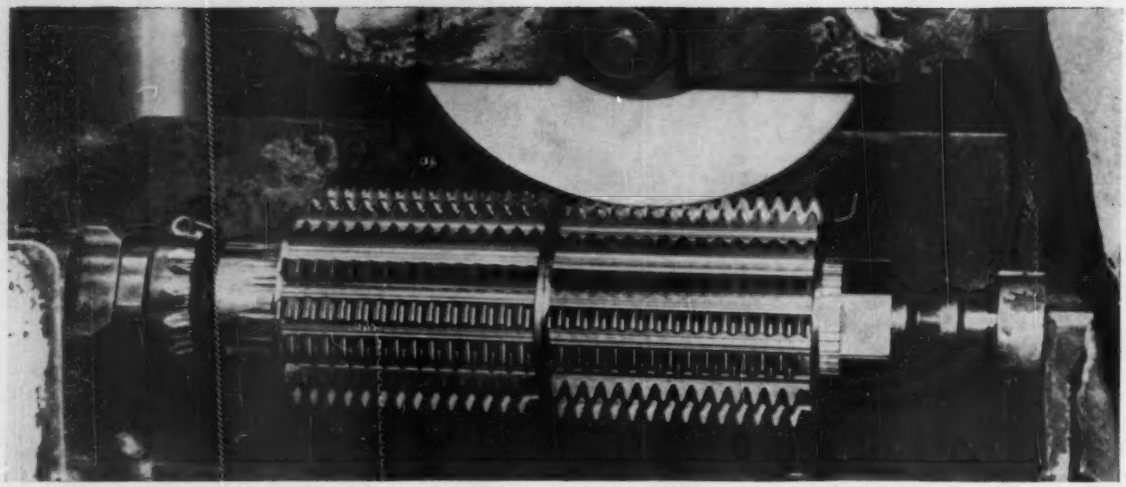
At the outer end of the bed of each of these traveling-column machines is a rotary indexable table. One 48 x 48-in.-square unit permits 6 feet of travel at its base, handles parts weighing 10 tons. The other table (72 x 108 in.) also has 6 feet of travel, but will support parts weighing 25 tons.

Because almost every machine tool shipped by Ingersoll is built to a special design, few parts come in lot sizes that justify single-purpose jigs and fixtures. Most orders call for a single part: occasionally three or four to a lot.

## 10 N/C machines in setup

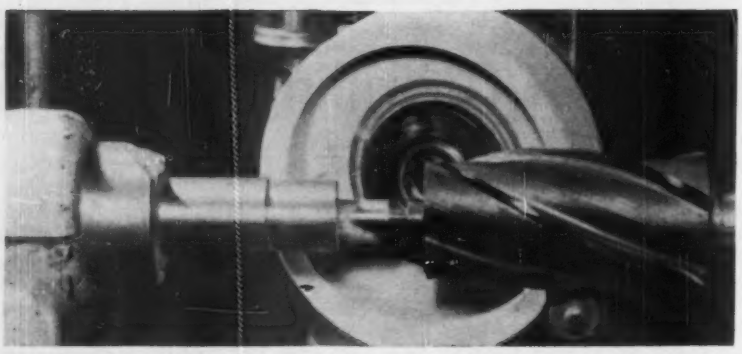
To minimize the cost of layout, drilling, reaming and tapping holes in parts ranging from a few pounds to many tons, Ingersoll has installed 10 numerically controlled drilling and boring machines in the last two years. With them, Ingersoll can speed up deliveries, and it can assure customers of the interchangeability of repair parts.

There are other advantages, too. Six tape-controlled drilling machines, using tools preset in quick-change holders, and operated by 14 men, are doing work previously assigned to nine conventional drilling machines and 22 men. •

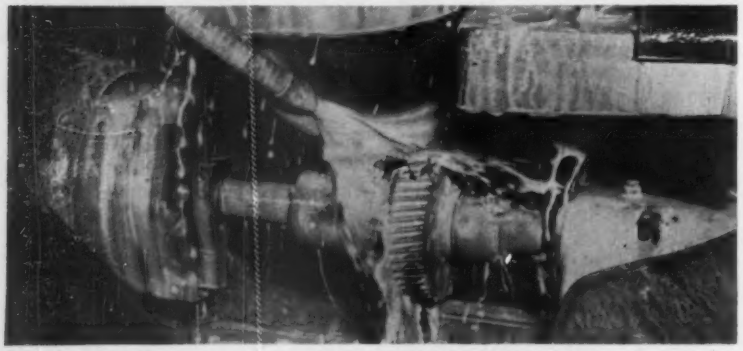


**Gear hobs are resharpened** with a PA60-H8-V40 wheel on a modified Barber-Colman hob grinder at Chevrolet-Cleveland Transmission Div of General Motors. Typical wheels for hob and form-relieved cutter grinding are PA54-F8-V40, PA-54-G8-V40, and PA60-G8-V40. Modified machine can grind two 4-in.-long hobs simultaneously

# New grit grinds tough alloys



**Secondary clearance is ground** on lands of 2-in.-dia T-15 end mill with a PA60-G8-V40 wheel at Productive Tool Service, Inc, Bay Village, Ohio. Heavy stock removal is achieved without burning or checking. Teeth were previously ground from the solid with PA100-L5-V40 and PA60-I5-V40 wheels. Guard was removed for photo



**Headstock gear is ground** with a PA60-I8-V40 wheel at Monarch Machine Tool Co, Sydney, Ohio. Operation requires extreme accuracy, formerly called for a roughing and a finishing wheel. Geometry, finish, and wheel life are improved

By H Paul Julien
Philip R Thomas
George W Thomson

Bonded Abrasives Division
The Carborundum Co
Niagara Falls, NY

**What kind of grinding wheel is best for grinding tools and parts made from today's new ultra-hard alloys? Say you had to sharpen a hardened HSS gear hob. You would naturally choose an aluminum-oxide wheel; but would you choose a grain that is strong enough to resist early breakdown or would you pick one that stays sharp?**

Until now that was the choice you had to make. But now we have a completely new aluminum-oxide grain that combines free cutting action, superior form-holding ability, and prolonged resistance to breakdown while grinding these hard-to-grind materials. Carborundum's Bonded Abrasives Division calls its latest development PA grain.

Formulated for toolroom grinding applications, PA grain has a characteristic light purple or pink color (hence the P in PA; the A designates aluminum oxide). It is available in grit sizes from 36 to 220, and is used with regular vitrified bonds in the grades and structures normally employed in toolroom wheels. Typical

## Grinding wheel marking

**PA54-F8-V40**

**P** — Manufacturer's symbol. Indicates exact kind of grain.

**A** — Abrasive type. A—aluminum oxide; C—silicon carbide.

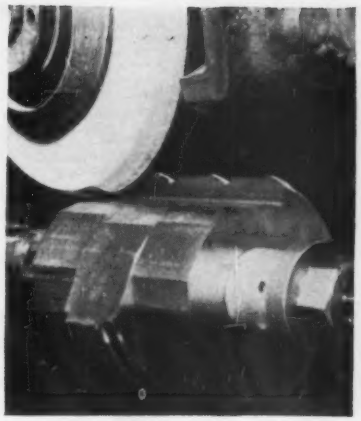
**54** — Grit size. Usual range: from 10 (coarse) to 600 (very fine).

**F** — Grade (strength of bonding). Range: A (soft) to Z (hard).

**8** — Structure number (grain spacing). Usual range: 1 (dense) to 15 (open) and up.

**V** — Bond. V—vitrified; B—resinoid; R—rubber; E—shellac; S—silicate.

**40** — Manufacturer's record. Usually indicates a bond modification.



**Hooks of gang-mounted** circular form tools are reground with a PA60-I8-V40 wheel at Delco Products Division of General Motors Corp, Dayton, Ohio. The 7x½x1¼-in. wheel permits heavy stock removal with minimum dressing

ranges are F to S grade and 5, 8, and 12 structures. One exception is in thread grinding, for which a special vitrified bond is used.

The combination of sharpness and strength provides a freer, cooler-cutting action with minimum dressing. Resistance to breakdown and early glazing results in better finishes, freedom from burn, improved work geometry, and increased productivity. The form-holding ability of the new grain permits its use in many automatic grinding operations, where extension of the dressing cycle is the only measure of productivity and, hence, of economy.

### Fused alumina abrasive

PA grain is a fused alumina abrasive consisting of gross anhedral crystals (crystals having the internal molecular structure of a crystal, but not its outward geometric form), principally alpha alumina with no matrix. It is a high-purity, friable grain of medium density which has been magnetically treated at high intensity, and which shows limited macro porosity.

A comparison of the physical properties of PA grain with those of a typical friable grain and a typical semi-friable grain shows that the new grain is intermediate with respect to ball-mill friability (of the fired grain), bulk density, and porosity.

PA grain, however, retains its sharpness longer than extremely friable grain, yet has the strength of semi-friable grain. Because of this higher strength, softer grades than are normally used are recommended. And in many cases, a single specification can satisfy a much wider range of grinding operations than could a single conventional aluminum-oxide wheel.

### Laboratory tests

First reports of the versatility of the new grain came from the laboratory. In one test a PA60-G8-V40 wheel took a 0.006-in. cut in beryllium without burn, check, or undue heat, and still produced a good finish. The best a conventional toolroom wheel could do was 0.003 in. This same PA wheel successfully ground both hardened vanadium steel and beryllium.

A 7x½x1¼-in. wheel, PA60-G8-V40, ground a Vasco Supreme (T-15 steel) tool 2 in. wide and 2½ in. long and removed 0.015-0.020 in. without burning or checking. The operator noted that he could grind Vasco Supreme in the same way that he ground regular tool steel.

### Field tests

Initially, PA grain wheels were tested in the field under disguised gradings so that machine operators would not know they were dealing with a new abrasive. As a result of the successful field test a full line of wheels is now available.

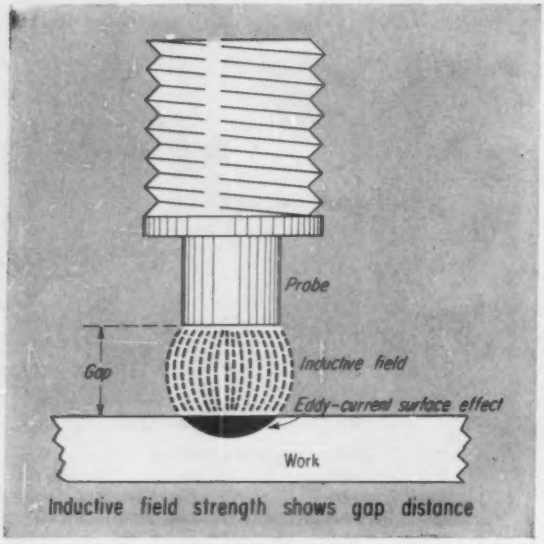
The ability of the new abrasive to grind ultra-hard abrasion-resistant materials is evident from the following list of grinding operations in which it has proved successful:

- Gashing and gullet-type operations such as hob and broach grinding and the grinding of circular form tools.
- Gear and thread grinding.
- Tool and cutter grinding (in materials such as Vasco Supreme, Unicut, MHV-6).
- OD grinding of hardened tool steels and other alloys, including many tungsten and molybdenum materials in the M-2, M-3, and T-15 ranges.
- Toolroom surface grinding of heat-sensitive materials and of flat form work.
- Cutting tool manufacture and reconditioning of tools.
- Internal grinding.
- Plane surface grinding (with large wheels).
- Certain cylindrical and centerless grinding operations.

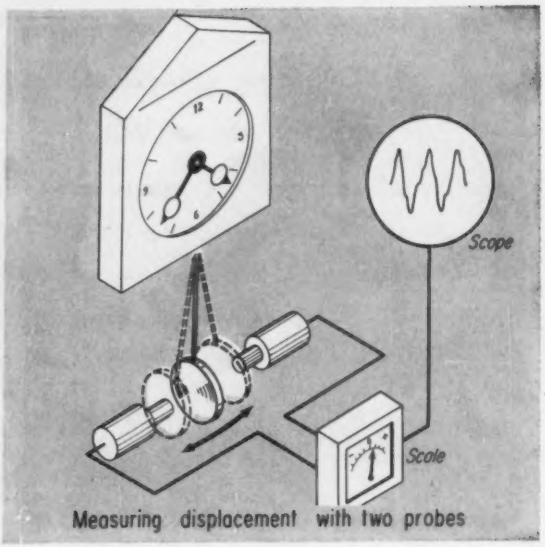
This grain has proved especially valuable in hob grinding and gear grinding, where both a heavy shearing action and discontinuous cutting are involved. It has also performed well where high unit pressures are encountered.

### Grinding large surfaces

PA wheels 24x6x14 in. are being used on a large Mattison plane horizontal-spindle surface grinder at the Burger Iron Co, Akron, Ohio. This machine can handle work 80 in. wide and 150 in. long on its magnetic chuck. A PA36-K8-V40 wheel of this size ground a 56x214x4¼-in. die blank flat and parallel within 0.001 in. over the entire length. The finished die shoe is in use at the East Dayton Tool and Die Co, Dayton, Ohio. •



Inductive field strength shows gap distance



Measuring displacement with two probes

*Gage a million a minute, to millionths!*

# Measuring parts in motion

**As many as 200,000 dimensional variations a second can be measured in moving parts (of rotor blades spinning at thousands of rpm for example), or the parts can be precisely balanced, with this new non-contacting eddy-current device. And, using surface effects only, it is sensitive to millionths of an inch**

By William M Stocker, Jr
Senior associate editor

Measuring the length, diameter and taper of bullets coming out of the fastest machine gun is child's play for a new non-contact technique developed by Abilities Inc of Albertson, LI, N Y.

So fast is this method that it will measure variations in the length of 80 blades spinning on a rotor at 16,500 rpm. (It is doing so on a test rig at GE's Small Aircraft Engine Department, West Lynn, Mass.) That's 1,320,000 blades spinning by the measuring probes in one minute!

Actually, this technique, which combines a non-contacting eddy current transducer with a choice of readout and/or recording modules, can measure as many as 200,000 dimensional variations a second.

It will measure within an accuracy of 2% of full scale, degrees, or decimal dimensions as small as 0.001 in. full scale (0.000010 in.).

It's all done with probes which never contact the piece to be measured. One set (two probes) for example, can measure the diameter of a piece as it passes the measuring point, while another set measures its length, and still another set might measure speed of rotation.

### Eddy-current principle

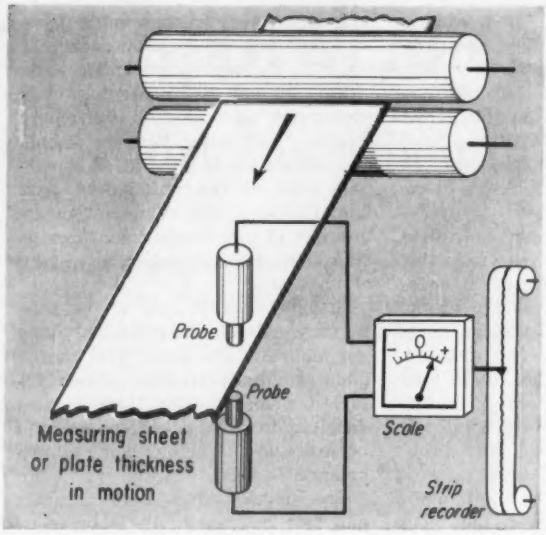
The device works on the eddy-current principle—an electric current is inductively produced within the body of a conductor when the conductor either moves through a non-uniform inductive field or is in an area where there is a change in magnetic flux. And although eddy currents can be induced in any material that conducts electricity, the effect is most pronounced in solid metallic conductors.

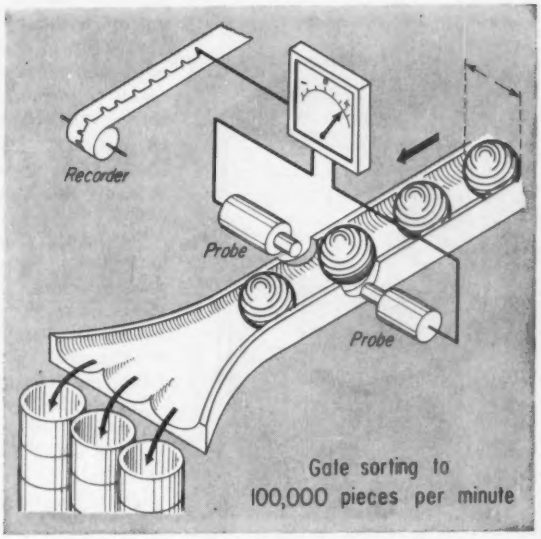
If a solid conductor is moved through a non-uniform magnetic field, voltages (emf's) are set up that are greater in that part of the conductor that is moving through the strong part of the field than in the part moving through the weaker part of the field. Therefore, at any one time in the motion, there are many closed paths within the body of the conductor in which the net voltage is not zero. There are thus induced circulatory (eddy) currents. Lenz's law shows that these currents circulate in the opposite direction to the motion of the conductive material through the magnetic field.

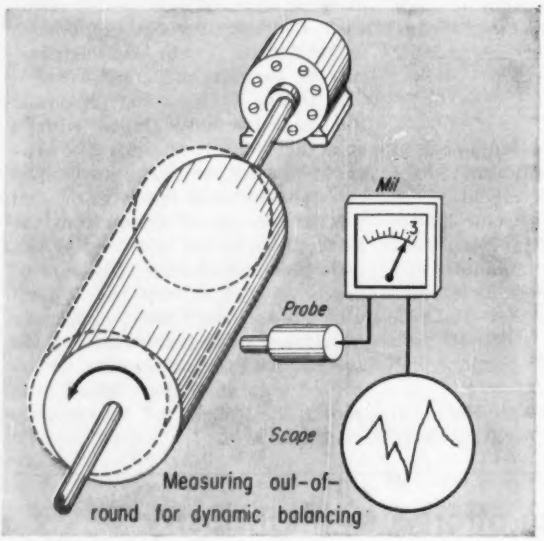
Eddy currents cause the heating in transformer cores. They are used in induction heating and to damp out oscillations in various devices.

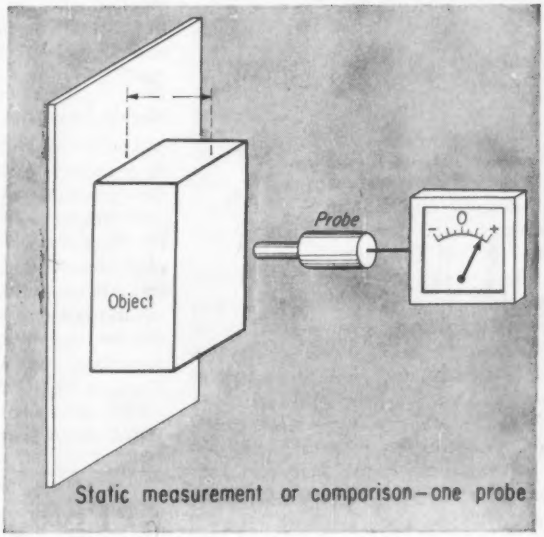
Normally, eddy currents penetrate too deeply into the body of a conductor, or are too randomly distributed, to provide a dependable point source of reference for measurement. In the technique developed by scientists of Abilities, Inc, the eddy currents are set up only in the surface of the conductor, in the "skin," to a predetermined depth of a few thousandths of an inch.

Controlled penetration is accomplished by establishing a rapidly alternating, shaped, inductive field in an air gap between the work and




the probe. Thus, the device is a highly sensitive proximity gage. Measurement is obtained as the width of this air gap changes.

Magnetic fields are established around and within any electrically conductive material (magnetism is not limited to ferrous materials, which are best known for their ability to *retain* magnetism). Thus, any metal, including liquid mercury, can be sensed with this instrument. In fact, a combination of metals can be sensed with the same gage.

Depth control, or measurement, is accomplished by energy dissipation as the probe is brought into proximity with the work. The energy loss is measured by an internal device, a Wheatstone bridge. This bridge is set at infinity, with no material in proximity to the probe, so the direct-current level of its second arm is zero (to zero the instrument). Then the potential in the arm rises as the probe approaches the metallic part to be measured. The distance is not sufficient to provide depth penetration, but is set for surface effects only.

**Gap not critical**

The voltage rise in the arm of the bridge determines the threshold distance, or gap. This procedure establishes zero within 3% of the threshold function. The normal gap range is 0.100 in. ±0.050 in. or 0.003 in. from absolute for scale zero. Gap spacing can be finer than this if necessary, but it does not affect measurement accuracy. This function applies only to setup.

Measurement, or comparison, is done from zero after the threshold distance is established. By analogy, the inductive field in the gap could be likened to a resistance. The gap is closed, the resistance decreases, and more current flows. The amount of current flow provides the measurement.

To dynamically measure parts in motion, switches turn on the amplifier and/or the readout instrument. From the latter, the user can read either the actual measurement or the differential from point to point.

Part displacement, whether sinusoidal (alternating as with turbine

## *Measuring parts in motion...*

**Complete control** in one portable instrument providing five scales

blades) or linear (flywheel periphery) will not change zero. However, minute changes in the gap distance, caused by variations in the part radius or diameter, will be picked up as root-mean-square displacement and amplified as signals from the detector, linear from 5 cycles to 100 kilocycles.

Scale readings range from 0.0003 in. full scale. The smallest increment is 0.000020 in. and the largest increment is 0.001 in. These scales are attenuated in five steps in the one system to permit dial switching from one scale to another and without resetting or rezeroing the gap.

A relatively large threshold rms of 10 millivolts for each 0.001 in. provides the linear function over the entire range and permits larger displacement in the same setup. Also, the output is sufficiently powerful to relay-control some fairly large automatic devices.

### Static measurement too

For static measurement, the same procedure takes place. However, a single transducer can be used for measurement, or two transducers can be used to gage thickness. With one transducer on each side of a sheet the differential between them and then between each of them in relation to its side of the sheet can gage the thickness. The output can be rectified to dc for direct analog measurement.

An automatic compensator avoids complicated setting of gap distance, and it provides a complete range of setting without need for a setting fixture or a spacer. The compensator also permits remote operation (such as inside a test cell or a machine) and changing the gain when an air gap, or inductive field, changes for mechanical reasons. The range of adjustment is ± 2½ decibels.

For stability, a crystal controlled generator provides the inductive field. Because the bridge is energized from the same source as the probe, a change in voltage level within the system (for instance, from line transients) is cut in half.

In addition to the two-probe differential method of measuring part also practical. Here, one probe thickness, a master comparator is gages a master part or block while the other probe senses the work dimension and the two readings are compared. A variation on this technique might use one probe to gage the part and a punched tape or magnetic tape to supply the master reading.

### Highly versatile

Applications of this equipment to date include automatic size control for precision cylindrical grinding, and measurement of turbine-blade-tip displacement. The instrument will measure degrees to minutes and seconds, as well as linear dimensions in millimeters or inches. Readout can be direct, as a print-out, as a recording, or on an oscilloscope. There is no limit.

This device has been used in high-speed (25,000 rpm) rotating tests, and satisfactory results have been obtained with probes operating at the 1000 F temperature range.

Not limited to measuring, this equipment also permits extremely sensitive balancing. Because unbalance shows up at high speed as displacement of the unbalanced part from its static axial alignment, measurement of this displacement can be translated into an accurate picture of unbalance.

Balance is taken, not at the supporting ends of the part, but along the length of the part. This multiplane gaging procedure shows actual displacement for force (mass) distribution. Thus corrections can be made at the actual point of unbalance.

The device offers both accurate and fast balancing. Parts balanced in a standard time of 22 minutes on a conventional precision balancing machine were balanced in 7 minutes with the eddy-current equipment, including the weight and distribution of varnish insulation.

In testing synchro-shaft response, this instrument (equipped with a spinning barrel to energize two synchros—master and slave) used two probes to compare the synchros and measure the error signal from the slave. Sensitive to ½-second of arc, instead of minutes, the eddy-current device showed a very fast "spike" which the standard tester completely overlooked. One revolution of the synchro motor, and reverse, is recorded on a strip chart which even shows the "click" of the synchro bearings. •

## APT program offered to all industry

For the first time since its inception in 1952 the APT (Automatic Programmed Tools) program will be offered to all US industries. Until now, the program has been restricted to only those industries in the aviation and aerospace manufacturing fields.

APT, a computer routine which translates English language directions for N/C machine tools into a sequence of instructions on punched tapes, is now under the direction of Armour Research Foundation of Illinois Inst of Technology (*AM/MM* —Dec 11 '61, p85). Since 1957 it has been under the direction of Aerospace Industries Association.

Under the program, personnel of participating companies receive training in APT computer language. In addition, each participant receives monthly progress reports, summary technical reports, training manuals, and the opportunity to take part in at least two technical meetings each year.

### $15,000 for 16 months

The fee for each organization is $15,000 for a 16-month period. Each additional division of a participating company and all government organizations may take part for $5000.

Participating industries which, because of special manufacturing problems, desire services beyond the scope of the present project will be permitted to receive additional assistance from Armour Research Foundation under separate research contracts. •

# Arc spotwelding at work

## 1... Button-welding mild steel sheet

**"Button welding" (named for the convex button of weld metal formed on the top surface of a properly welded joint) combines high quality and low cost to speed joining of mild steel sheet**

By Robert J Keller, chief engineer
Welding Products Division,
A O Smith Corp, Milwaukee

An offshoot of $CO_2$-shielded continuous arc welding, "button welding" is proving a triple-threat to conventional welding methods in a number of applications—it is cheaper, faster, and welds are better. Not only that, the job can easily be done by semi-skilled operators.

Actually, button welding it somewhat limited in its applications, but in those instances where it can be used, it has proved much less expensive than electric-resistance spot or projection welding, riveting or conventional manual arc welding. One such application is in the production of overlapping joints in mild (low carbon) sheet steel assemblies where thicknesses range from 1/32 to ¼ inch.

Button welding, which as has been mentioned, is an outgrowth of $CO_2$-shielded continuous-arc welding, has similar water-cooled, continuous-arc welding guns, which can be positioned either manually or automatically.

At A O Smith, the gun is equipped with a slip-over, notched arc shield which, when placed on the top plate of the joint to be welded, locates the electrode wire at the proper height over the weld position. The shield, which contains the shielding gas, also protects the operator's eyes against light emitted by the welding arc.

It is not necessary to drill or pierce a hole in the top plate of the joint before making a button weld. Instead, the arc is struck on the top plate. An accurate, automatic cycle timer maintains the arc until a hole is melted through the top plate, and penetration and fusion is achieved in the bottom plate.

Metal left over after the consumable electrode wire is fed through the welding gun fills the hole burned in the top plate, leaving a slight reinforcement—the convex "button" from which the process gets its name—on the upper surface.

### Special equipment needed

For welding overlapping joints in mild steel sheet up ¼-inch thick, a power source is necessary which can provide controlled high amperage and a heavy-duty cycle (for heavy production work), as well as very low amperage for welding joints in thin-gage sheets.

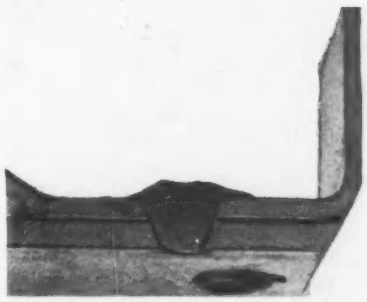
The power source generally chosen for this work is a 600-amp, constant-potential welder with a 100%-duty-cycle rectifier. This unit's 45-volt open-circuit rating is desirable for welding the thicker joints, while controls allow the voltage to be reduced to low values for thinner joints.

And because the volt-ampere curve can be made to droop (as in a constant-current power source), short-circuit current can be limited when welding thinner joints — an effective prevention against burning through the thinner sheets.

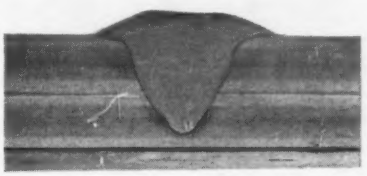
Because button welding depends upon precise timing, an accurate timer and precision wire-feeding device are essential. It is important that the wire feeding mechanism start moving the wire promptly when the trigger is pulled, and that its movement stop immediately when the trigger is released. Generally, an electronic braking device is necessary.

Usually, a fully electronic timer, which can be set accurately and which operates within ±0.5 cycle, is necessary. But pneumatic timers have proven satisfactory in some applications.

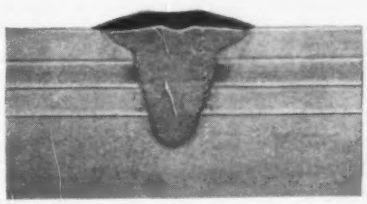
If burn-through occurs (as in welding light sheets, or in overhead positions), a reactor may be needed in the circuit to limit the current. The reactor operates somewhat like



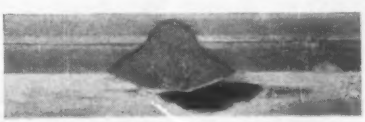
**Button-welded joint** in two ⅛-inch-thick galvanized steel parts for an overhead garage door track



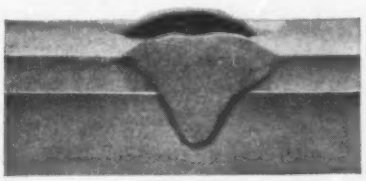
**Button welding** achieves excellent penetration between two ¼-inch-thick mild steel plates



**Three ⅛-inch-thick mild steel sheets** are button-welded to a ¼-inch-thick steel plate

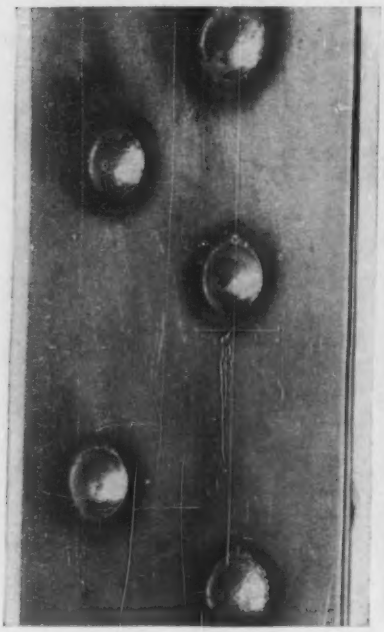


**Button welding of** 0.135-inch-thick mild steel stock to 0.135 and 0.375-inch-thick steel plate

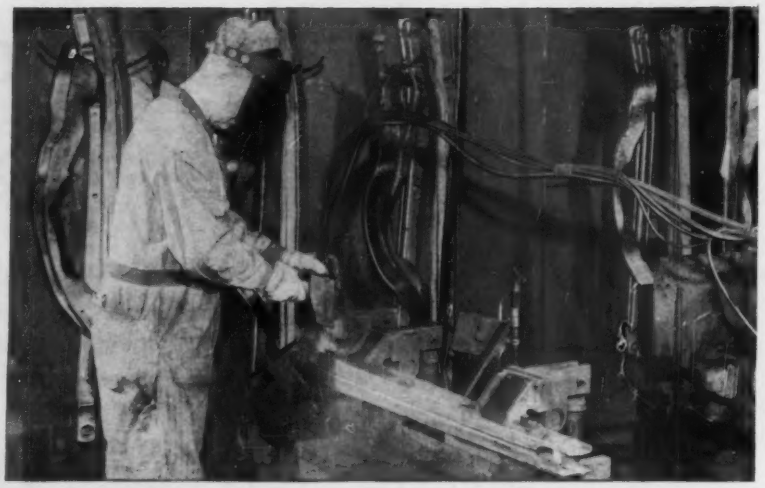


**Same welding operation as shown in** photo immediately above. Both welds are typical of auto body fabrication

## *Button welding...*



**Test button welds** made by A O Smith at 3 o'clock position in two sheets of 18-gage steel. Small wires at low current density with relatively long arc time were used in making the welds



**Simple, inexpensive air-clamped fixture** holds two stamped parts of truck frame trailing arm assembly tightly together while the operator uses a hand $CO_2$-shielded gun to make 10 button welds in quick succession. Trailing arm is 4-½-ft long, consists of two 0.180-in.-thick mild steel stampings joined back-to-back. Filler wire used in the 10 welds is 1/16 in. diameter

the drooping volt-ampere curve previously mentioned, but it also incorporates an element of time delay.

Selection of filler wire is important, because of the relatively short welding cycle (sometimes as little as 0.2 second). The wire must be as completely deoxidized as possible, so that the deposited weld nugget is sound and free from porosity.

Filler wire deoxidized with manganese, silicon and aluminum has the additional advantage of being able to tolerate relatively large amounts of scale, cutting oil and drawing lubricant without adverse effect on the weld. And cleaning of components before welding is not so critical when such wires are used.

### Button vs projection welds

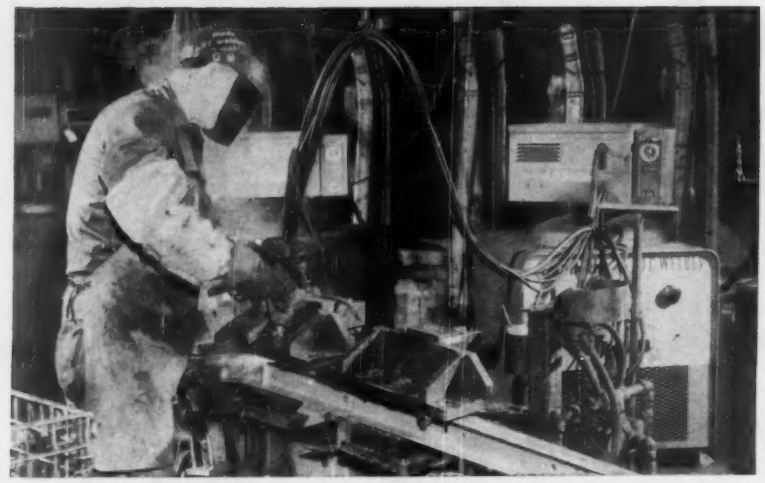
Compared with resistance spot or projection welding, button welding has these advantages:

- More flexibility — Button welds can be made without having to reach both sides of a joint, and it is not necessary to move large pieces when successive welds are required. The piece can be positioned in a fixture and the light gun moves from weld to weld.
- Only minimum pressure is needed to achieve contact with the work. High-quality welds can be achieved without quick followup or forging pressure (as in resistance spotwelding).
- No inductance or shunting effect from one spot to another occurs (because of throat depth) as in resistance spotwelding.
- Quality of the weld does not depend upon the electrical resistance of the contact surface. Button welding—a straight fusion process—is not affected by variances in oxidation or foreign material on the surfaces of the sheet.
- Weld quality can be checked visually, especially if both sides of the work can be seen.

**Table I—Typical shear strengths of single button welds**

| Metal thickness (In.) | Wire diameter (In.) | Welding current | | Weld time (Cycles) | Typical shear strengths (Pounds) |
|---|---|---|---|---|---|
| | | Amps | Volts | | |
| 0.035 | 3/64 | 140 | 30 | 30 | 1,200 |
| 0.035 | 3/64 | 110 | 24.5 | 70 | 1,400 |
| 0.035 | 3/64 | 90 | 24 | 120 | 1,600 |
| 0.078 | 1/16 | 320 | 36 | 60 | 3,400 |
| 0.086 | 1/16 | 310 | 37 | 60 | 3,500 |
| 0.118 | 1/16 | 390 | 41 | 40 | 3,900 |
| 0.118 | 1/16 | 390 | 42 | 50 | 4,700 |
| 0.134 | 1/16 | 400 | 41 | 40 | 4,900 |
| 0.156 | 1/16 | 430 | 41 | 50 | 5,050 |
| 0.180 | 1/16 | 440 | 46 | 80 | 6,000 |
| 0.250 | 1/16 | 580 | 43 | 105 | 14,000 |

**Results of test welds** made at A O Smith while developing processing data for production applications of button welding. All joints were of overlapping design and made between 1-inch-wide specimen of the thicknesses shown. Shear strength of a button weld is proportional to the cross section of the weld nugget at the faying surface, and can be varied by adjusting current, voltage and time. For these test welds, no gap was permitted between faying surfaces of the sheets



**Clamp plates on weld fixture** (made for joining reinforcing plate to top of basic truck frame trailing arm) are cut away to clear and locate the button welding gun. Cylinder-actuated clamps are controlled by a single valve to speed loading and unloading. Button welded trailing arm shown here can be strengthened by button-welding a reinforcing cover plate to the trailing arm assembly

**Table II—Economics of button welding**

| Metal thickness (In.) | Wire diameter (In.) | Wire used per button (In.) | Wire cost per 100 buttons (Dollars) | Arc time per 100 buttons (Seconds) |
|---|---|---|---|---|
| 0.062 | 3/64 | 3 | 0.057 | 57 |
| 0.118 | 1/16 | 3⅞ | 0.110 | 66 |
| 0.134 | 1/16 | 4 | 0.120 | 70 |
| 0.156 | 1/16 | 5⅛ | 0.183 | 83 |
| 0.187 | 1/16 | 8 | 0.250 | 90 |
| 0.250 | 1/16 | 9½ | 0.286 | 160 |

• Button welding equipment generally costs less than equivalent resistance welding equipment.

### Disadvantages

Conversely, however, button welding has some drawbacks in comparison with electrical resistance spot or projection welding:

• It is difficult (sometimes impossible) to make button welds with the top surface flush with the top face of the joint—a job easily done on a spotwelder.

• Consumable material (electrode wire and carbon dioxide gas) is required for each weld.

• It is harder to weld "out of position" on heavier gages.

• It is harder to produce satisfactory welds on coated steel (such as plastic-coated or galvanized stock).

### Button vs manual arc

Button welding has several advantages over manual arc welding with coated electrodes:

• Quality of the weld is generally better, because current, voltage and time of each weld are controlled automatically.

• Button welding develops no slag, so that cleaning of finished joints is easier, quicker.

• Joints can usually be completed in less time.

• Button welding leaves no weld crater. Short tack welds, made by manual arc welding, on the other hand often leave a crater that is half the length of the weld, thus reducing weld strength.

• Working conditions are better—less smoke and weld spatter.

• Training time for operators is reduced materially. Button welding does not require manual dexterity or a high degree of coordination between hand and eye.

However, it must be remembered that button welding equipment costs more than manual arc welding equipment, and it requires more and better maintenance. And button welding is less flexible. You cannot, for example, button weld 100 feet away from the power source and wire feeder.

Button welding, which is sometimes compared with riveting, is less costly. But it does produce a rigid joint, whereas a riveted joint tends to be flexible. Where fatigue is a factor, riveting may thus be preferable.

### How strong is a button weld?

Button welding generally deposits weld metal with a tensile strength of 75,000 psi in mild steel. But because button welding is mostly used for producing overlapping joints between steel sheets, the shear strength of the joint is of utmost importance. For this reason, A O Smith's tests have mostly been made on single button welds joining 1-inch-wide specimens (similar to those for checking spotwelded joints in shear).

Because shear strength of a button weld is proportional to the cross-sectional area of the weld nugget at the faying surfaces (surfaces in contact), the shear strength of a button weld that joins sheets of a given thickness can be varied considerably by changing the controlled variables of current (Table 1).

If more than one button is needed per joint, the strength of each of the buttons will be less than the shear strength of a single-button weld—because it is difficult to divide the load equally between several buttons. This is true, of course, of multiple-resistance spot or projection welds.

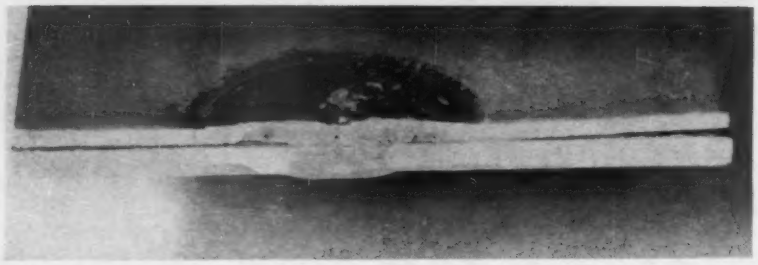
Because button welding makes high-quality joints at a low cost, A O Smith is using it for more and more production applications—particularly for making subassemblies for car and truck chassis frames. Button welding is finding uses in a number of other metalworking plants throughout the country, where product design engineers have gotten together with welding engineers to produce designs that take advantage of button welding economies. •

# Arc spotwelding at work

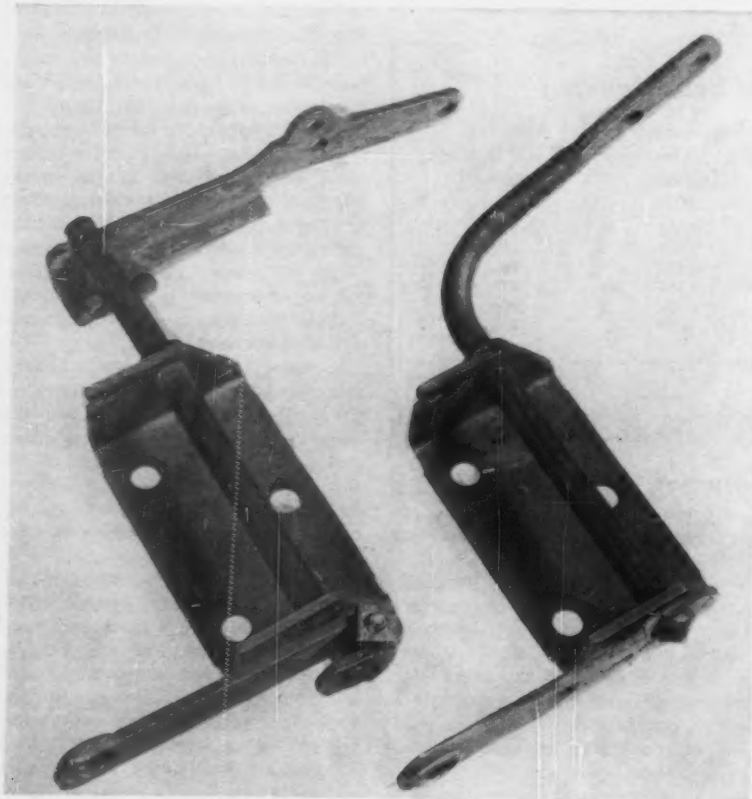
## 2... Improving assembly at Chrysler

**Call it what you will—Conel, button, fusion or poke gun—arc spotwelding is finding its place in the auto industry. Reason: An arc spotwelded joint between two sheetmetal parts can be stronger than a continuous weld joint**

By Charles Emerson, Detroit editor



**Burn-through weld** completely penetrates top layer of metal, and goes well into second layer. Added filler metal forms the button



**Accelerator-shaft assembly** is a typical engineered arc spotwelding application. Shaft has been arc spotwelded to the lever to replace the fastener (old assembly at left) and to eliminate machining and bending. This also reduces stock required

Arc welding at one spot on the work takes less time, less effort and less equipment than running a full bead along the length of the joint. That stands to reason.

### Sounder joints, less distortion

But arc spotwelding has more to recommend it than economy. It can, as Chrysler has found out, produce a joint between two parts of sheetmetal that is structurally sounder than a continuous weld joint. And there is little or no distortion in the sheetmetal.

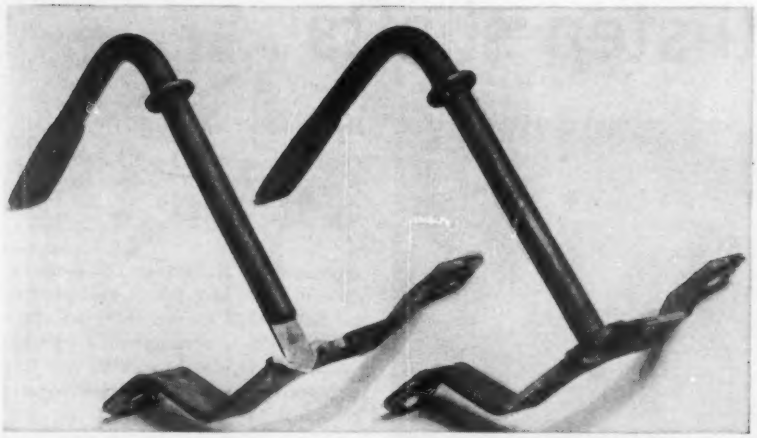
If conditions are ideal, that is, and if the job has been specifically designed for arc spotwelding. Then it means a better, stronger end-product.

One production assembly at Chrysler has been arc spotwelded for three years (it's not a new technique) with outstanding functional results at low cost.

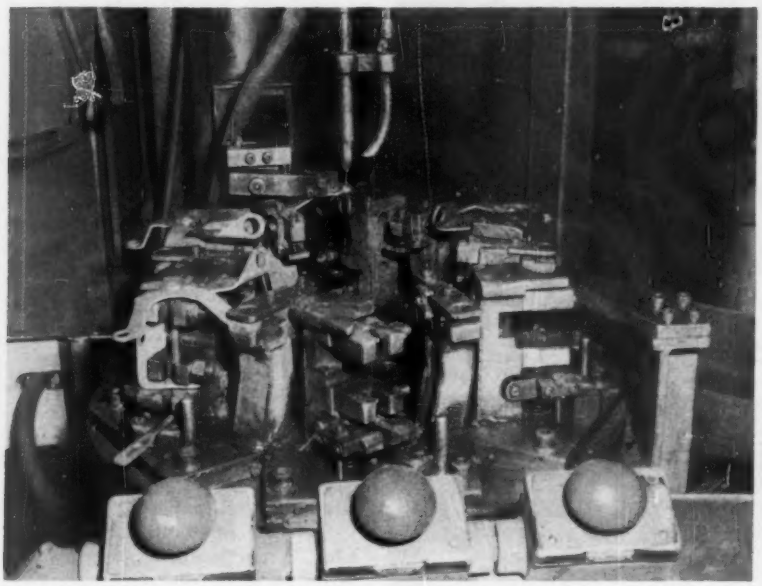
### The advantages

Recent advances in welding equipment—wire drives, timers, reactors, shielding methods, and small-diameter wire—have made arc spotwelding a practical production technique, one with several inherent advantages over other methods:

- Tooling is simple. Little clamping or hold-down pressure is required and the machinery can be light. Hand guns will work on parts that cannot be handled on a fixture. Some underbody sheetmetal work can be done with hand guns while the automobile body is still moving.
- No backup is needed—welds can be made from the outside on box sections or other enclosed shapes. The assembly merely has to be held together snugly while the weld is made.
- Power demand is low. Two sheets of 0.035-in. stock can be joined with about 3 kw. Power factor losses are extremely low.
- Equipment is simple. Air-cooled guns replace water-cooled guns because less heat is needed. Other advantages: hand guns are easily re-



**Another accelerator-shaft assembly,** for an automatic-transmission model, has been cut away to show complete weld penetration



**Simple, inexpensive welding machine** is hand loaded to rotate turntable for welding at rear. Filler metal feeds straight down; curved tube supplies $CO_2$ shielding gas

placed if they fail, schedules are fixed, no adjustment by the operator is required.

• Controls are better, simpler, cost less, are lighter, and easy to maintain. An electrical instrument man can replace small rectifiers and other simple parts without getting involved in complicated electronics.

• Each spot stands by itself, an important advantage. Once the gun is set for a given gage of metal of known characteristic (this is easy to check with sample sheet metal), the equipment can be expected to repeat indefinitely, unless conditions change.

Because each spot is unaffected (or at most very little affected) by other spots, there is no heat warping, expansion, cratering, undercutting or poor fusion—as long as equipment settings are maintained and machines are kept in shape. Welding angle, speed or motion, and tracing accuracy (all required in continuous welding) have no effect.

$CO_2$ shielding for arc spotwelding is inexpensive, yet it allows for deep penetration and high speed—especially for burn-through welding. Argon achieves accurate arc control, low weld spatter, and is especially good on critical jobs, but it costs more. And submerged arc spotwelding practically eliminates spatter, but it too costs more than $CO_2$ welding.

Flexibility is the great advantage of arc spotwelding. Once the process is accepted and understood, it takes little work to switch from one shielding method to another, or from one cycle setting to another.

And arc spotwelding is adaptable to a variety of joints: lap joints for such sheet metal parts as stampings, burn-through joints for joining sheet metal, plug joints for such heavy stock as brackets (this kind of joint takes loads well because the deposited metal also acts a rivet).

Arc spotwelding first went into production at Chrysler on a test basis. The setup, which paralleled that of Chrysler's existing setup for joining parts of a station wagon seat back, worked so well that the company had it duplicated several times to handle full production.

### Integrated with production

Arc spotwelding is now dovetailed with overall production. For instance, an accelerator shaft assembly is now joined at a seven-station rotary fixture, where parts are manually loaded at the station in front and ejected as finished assemblies. Production rate is 250 parts an hour.

This was originally a mechanical assembly, made with a threaded fastener. The bracket had to be bent, drilled, milled, and hand assembled. Now, the pivot shaft is simply welded over to lock the parts together, eliminating the costly mechanical fastener as well as cutting assembly time sharply. Although capital-investment savings were found to be negligible, a saving of 12% in production man-hours was realized by using arc spotwelding on this particular part.

Another current production part is an annulus gear that was originally designed as a single piece (too much machining and too much material), then changed to a three-piece mechanical assembly (flat plate had to be gear-cut to match the internal-thread contour), then finally to a simple round plate arc-spotwelded to a shoulder in the edge of the ring gear.

Overall size of the gear was reduced to make it use less material. The gear can now be cut from seamless tubing, and it requires less machining altogether. In fact, the gear teeth can now be broached. The support plate is now made of less expensive low-alloy material, and both heat treating and grinding are simplified. Welding is the final operation. •

# Facing multi-step shafts

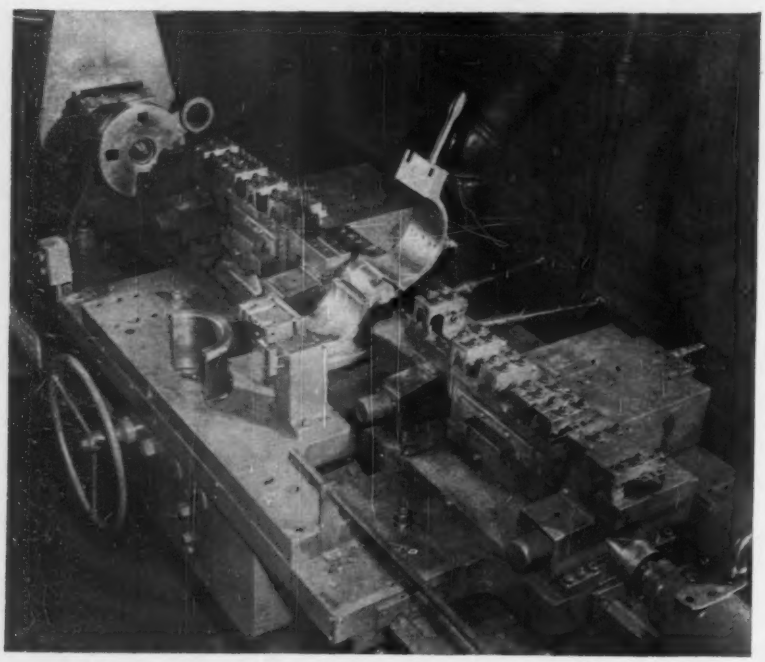
By Kenneth E Schultz

Chief engineer, Tools and Facilities
West Allis Works, Industries Group
Allis-Chalmers Mfg Co
West Allis, Wis

**A reduction of 94% in the time required to do any job is pretty spectacular, but it's even more so when the cutback is accomplished by converting a standard machine tool into a "special" capable of performing a complex, 13-step operation.**

It now takes just 30 minutes floor-to-floor time to face and groove at 13 points along a multi-diameter shaft nearly 75 inches long and 8 inches in diameter at the largest step. The job once took 8 hours.

**This converted shaft lathe** (made from a standard shaft lathe) has cut floor-to-floor time for this multi-diameter shaft facing and grooving operation from 8 hours to 30 minutes. Actual cutting time: only 9 to 30 seconds



**Preset carbide-tipped tools in adjustable blocks** are mounted on rear tool slides, which are supported by the carriage of the converted shaft lathe. There are 6 tools in the left-hand support plate, 7 on the right-hand plate

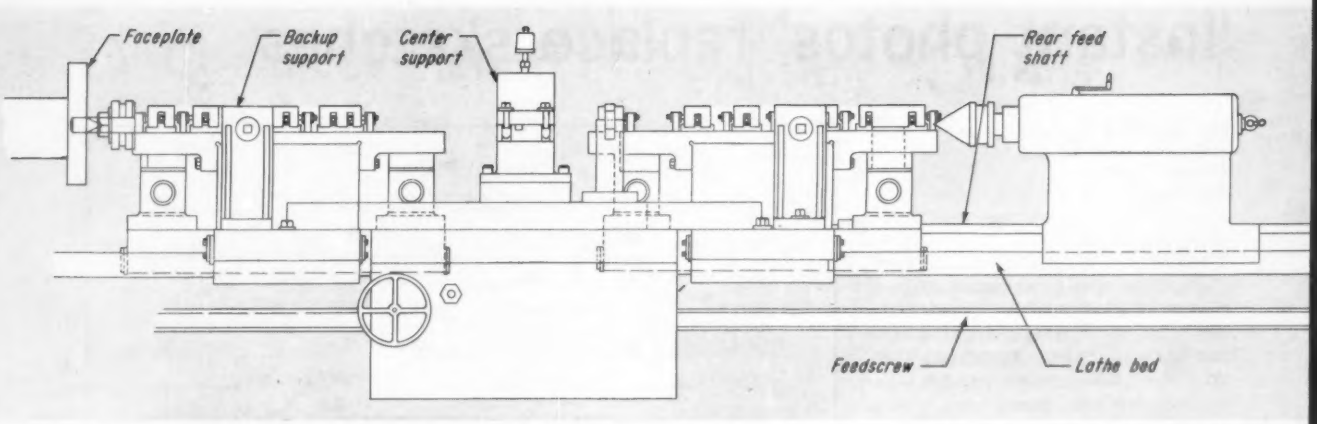
## Converted lathe

Conversion of a standard shaft turning lathe to a multi-tooled special began by replacing the carriage with a special elongated carriage with a top face flame-cut from 4-inch-thick steel plate and machined to suit. Then the 15-hp headstock drive was replaced by a 40-hp Allis-Chalmers motor that drives the spindle directly (by means of V-belts).

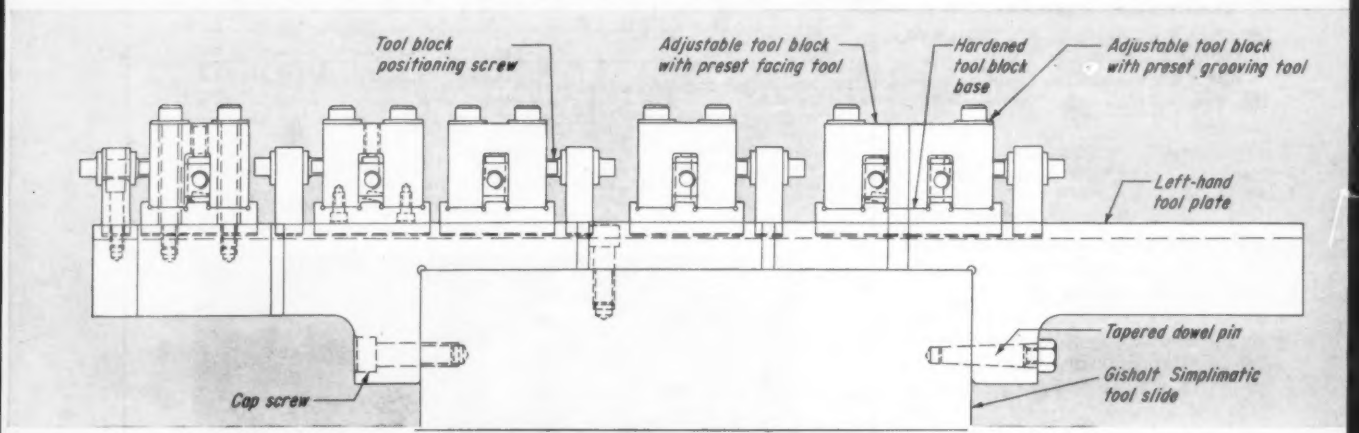
Two standard cam-fed, cam-returned tool slides (taken from a standard automatic lathe) were then mounted on the rear of the new carriage. These slides are powered from a feed shaft, supported on brackets bolted to the rear of the lathe bed and connected to the feed screw in front of the lathe through a chain and sprocket drive and a jaw clutch.

Bolted and doweled to each tool slide is a heavy steel plate, on which are mounted preset tool blocks. Inverted carbide-tipped facing and grooving tools are mounted in the blocks. Reason for the inverted tooling: It is not necessary to reverse the normal counterclockwise rotation of the lathe spindle—and the chips fall away from the tools.

Each toolblock is bolted to a hardened-steel grooved base, which has adjustable stop screws in the rear stop block, and is arranged for lateral adjustment with a horizontal screw threaded into a hole tapped into one side of the toolblock. This arrangement makes it possible to remove a toolblock for replacement of a cutting tool without taking out either the adjustment screw or the positioning block.




**Lever-operated jaw clutch** and chain drive connect feed screw in front of lathe to rear feed screw which actuates cams in Simplimatic tool slides at rear of lathe carriage. Center support bearing and two cutter backup support stands minimize chatter during cut. Special driver on end workpiece engages slot in faceplate on lathe spindle, driving shaft steadily


Tool block positioning screw
Adjustable tool block with preset facing tool
Hardened tool block base
Adjustable tool block with preset grooving tool
Left-hand tool plate
Tapered dowel pin
Gisholt Simplimatic tool slide
Cap screw

**Similar adjustable tool blocks** (with preset carbide-tipped tooling) are used on both tool plates, at rear of lathe. If two tools must be close together, they are spaced accurately in a single tool block while the tools are being preset away from the lathe. Individual blocks are preferred because they provide maximum adjustment for different shafts

A long keyway, machined longitudinally in the top face of each tool support plate, aligns the toolblock bases with the axis of the lathe. In this way, little time is lost in realigning tools when replacements or new setups are necessary.

### Absorbing vibration

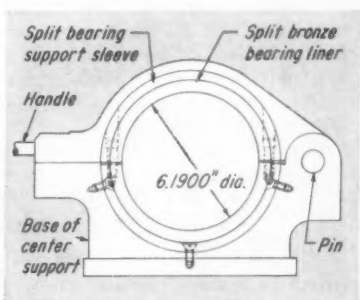
Vibration can be caused by rapid rotation of the workpiece when pressure is applied to one side by the cutting tools. To absorb this, the shaft that is being faced and grooved is supported by a sleeve-bearing center support bolted in the middle of the lathe carriage.

If the shafts to be machined have a greater overall length than that shown in the photographs, two adjustable half-bearings (one at each end of the carriage) improve stabilization. These half-bearings can readily be removed when they are not needed.

Faces machined at Allis-Chalmers have ranged in diameter from 2⅜ in. to almost 8 in. Cutting speeds have ranged from 660 fpm down to 165 fpm at 330 rpm spindle speed.

Because of this wide variation in cutting speed, and because some tools must cut a heavy nickel plate (previously applied to some portions of the shaft), while others cut only in steel, tool life has varied from 10 to 300 pieces per tool.

As has been mentioned, floor-to-floor time was cut from 8 hours to 30 minutes per shaft. Even so, actual cutting required only from 9 to 30 seconds of this time when using the 13 carbide-tipped tools. The rest of the 30 minutes? Loading and unloading, inspection, deburring, and tool care. •




**Split-center support bearing** (mounted on lathe carriage to prevent spring in a long shaft while it is being faced and grooved) has split fabric-reinforced phenolic plastic liner bolted to bores in base and hinged cap. Inside this liner is a 5½-in.-long heavy bronze split bearing. Upper half of the bronze bearing is removed by loosening four cap screws when hinged cap is opened to unload

# 'Instant photos' replace sketches

By Richard J Cable
production methods engineer
Pioneer Engineering
Minneapolis

**Photographs of job setups have replaced engineering sketches on most of our work-procedure sheets (see picture). As a result, drafting time has been slashed by more than 60%. And we have saved hundreds of engineering man-hours.**

Whenever we run a new job, we photograph the machine setup with a Polaroid Land camera. In only ten seconds we have a permanent picture record. Each picture is attached to a time-study evaluation of the job, and the completed sheet goes to the shop foreman for filing.

When the same job comes up in the future, the shop foreman simply pulls the procedure sheet for the job from his file, then gives it to the machinist who will do the work.

PIONEER ENGINEERING

STANDARD WORK PROCEDURE

PART NO: CP-4554 PART NAME: Roller Shaft DRWG. NO: B-3001

OPER. NO. & DESCP: #50A - Drill & Tap MAT'L. SAE-1035 WT: 20.4#

BHN RANGE Heattreat 40-50 ACTUAL BHN: ALLOWANCE: 10% Personal and Fatigue

MAN HRS/PC .18058 MIN/PC 10.83 PC/HR 5.53 STD. SET BY R. J. C. DATE 10/17/60

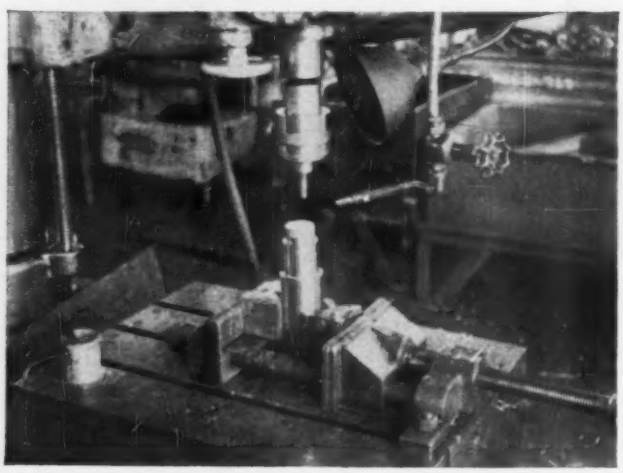
JIG OR FIXTURE JIG OR FIXTURE DRWG. NO:

FOREMANS APPROVAL CA DATE: 11/14/60

MACHINES, SPEEDS, FEEDS, EQUIPMENT, TOOLS, ETC. USED AT TIME OF STUDY: Mach. #17 - Cinn. Bickford Radial Drill. Std. Vise with pair of V-blocks. 5/16" drill @ 540 RPM, .007 feed, 3/8" tap @ 360 RPM

THE FOLLOWING WORK PROCEDURE INCLUDES ONLY TIME FOR ELEMENTS LISTED BELOW AND DOES NOT INCLUDE DELAYS SUCH AS Setup, Clean up, Oiling, Coolant, Change or Sharpen Tools or Change Job Tickets.

1. Pick up part from tank and position in V-blocks in vise and tighten.
2. Chalk end, layout 2 holes and center punch 2 holes.
3. Drill and tap 2 holes (NOTE: use 2 passes of the tap on each hole due loose spindle to keep tap from breaking).
4. Loosen vise and turn part over and retighten.
5. Repeat elements 2 and 3 on 2nd end.
6. Loosen vise, remove part, blow and wipe clean and pile to tank.



### Old method time-consuming

Because our products—heavy-duty equipment for rock quarrying and road paving—are so specialized, we do not require a large parts inventory. And most of our machining jobs are short runs; thus it is not practical for us to cast permanent jigs and to stockpile parts. Yet most of our machining jobs do recur from time to time, and we do need a permanent record of each job method and machine setup.

Formerly, a draftsman made a design sketch to go with the instruction sheet. But the simplest sketch could take two hours to draw. Even then, machinists had trouble understanding the 2-D drawings. We considered using conventional photographs, but the film takes too long to develop. When it returns three to four days later, you often find that all the details you require are not in the picture.

### Switch to instant photos

One day last year, I brought my own Polaroid Land camera to the shop. We made a few tests and found the answer to our problem. Perhaps the most obvious advantage is that, with pictures available in ten seconds, we can check each print on the spot, to see if all the details we need are there.

Other advantages: We estimate a savings of at least two engineering man-hours per setup, or about 520 hours a year for each of our four Production Methods engineers. And our drafting requirements, which used to demand a full-time worker, can now be satisfied by a part-time draftsman.

The shop now has its own camera, which uses Polaroid's Type 47 film. Rated at 3200 ASA, the high-speed film takes pictures in normal shop light, doesn't require cumbersome lighting equipment.

Because the pictures are so quick and so easy to take, we make two shots of each machine setup. One is attached to the foreman's file copy of the procedure sheet. The other goes onto a duplicate copy that, kept on file, gives us a master copy in case the foreman loses his.

Every week, we take about fifty pictures, which cost about 23¢ each—about one-fifth what we would have to pay an outside photographer. Although we shoot more than 2500 pictures a year, our annual photo costs are under $575. •

American Machinist / Metalworking Manufacturing

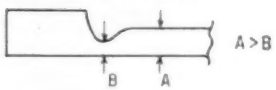
REFERENCE BOOK SHEET

# Chemical Milling I—a glossary of terms

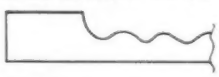
By George H Fox, Jr, manager, and Hugh H Muller, supervisor of technical services,
Chem-Mill & Coatings Div, Turco Products, Inc, Wilmington, California

Chemical milling not only permits fabrication of light-weight, high-strength parts for aircraft and missiles, but is competing elsewhere with metal-cutting processes. Advances in the art have been so rapid that the authors have assembled a "Chem-Mill Design Manual," from which the following excerpts are taken. The illustrated glossary of terms on this page gives an idea of what can be done by chemical milling, as well as providing definitions. The tabulation on page 77 summarizes the kinds of ferrous and non-ferrous alloys that have been successfully processed by chemical milling. It is said that cuts up to 2 in. thickness have been made in plate, but the maximum depth of cut is normally ½ in.

**CHANNELING**—The formation of a groove or channel at the fillet.

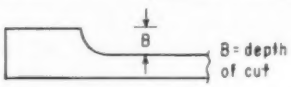



**CHANNELING, GAS**—The formation of vertical grooves or channels in the etched surface by bubbles of hydrogen ascending to the surface of the etch bath.

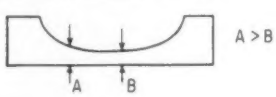


**CURING**—Preparing the mask coating so that it will withstand the etching solution. **Oven Cure**—Mask cure by heating it in an oven at a particular temperature for a specific length of time. **Air Cure**—Mask cure by allowing coated part to stand in air at room temperature for a specific length of time.

**CUT** or **DEPTH OF CUT**—The thickness of metal removed measured in the direction normal to the original metal surface.

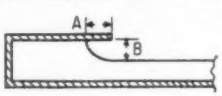



**DISHING**—Thinning of the central portion of the web resulting from an increasing etch rate from the side to center of a cut: caused by improper control.




**ETCH**—The process of removing metal from desired areas of a part by dissolving it in a suitable solution.

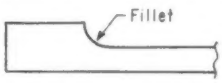
**ETCH FACTOR**—Also "undercut ratio." The etch factor is the ratio **A/B**.




**MASKING**—The process of applying mask to metal surfaces.

**ETCH RATE**—The amount of metal removed per unit time expressed in thousandths of an inch per minute or in mils per minute.

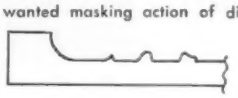
**FILLET**—The concave shoulder between the etched surface and the non-etched surface.



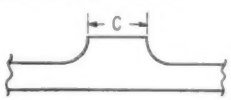

**FILLET NOTCH** or **NOTCHING**—A notch at the bottom of the fillet radius caused by scribing too deeply.

**GANG MILLING**—The etching of more than one part at a time. Usually the etching of one sheet which will be cut into two or more parts after chemical milling.

**ISLANDS**—High spots within an etched area which result from a non-uniform etch rate; this being caused by the unwanted masking action of dirt.



**LAND**—A relatively narrow strip of unetched metal dividing adjacent etched area. See C in sketch.

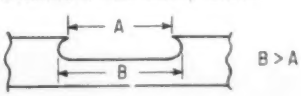



**LINE DEFINITION**—Refers to the quality of the etched line, ie, the extent to which the actual etch line deviates from the ideal etch line.

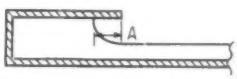
**MIL**—1/1000 of an inch (0.001 in.).

**M/S/M**—Mils per side per minute (a way of expressing rate of etching).

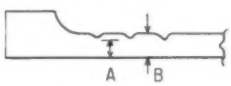
**OVERHANG**—See sketch, below.




**OVER MASK**—The mask which extends over the desired etch line. This would be **A** in sketch below. (Same as undercut.)

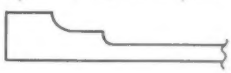



**PITTING**—Formation of pits or depressions in the etched surface.




**RIDGING**—Formation of a raised edge at the base of the fillet.

**STEP CUTS**—Multiple cuts of different depths in the same piece of material.



**STRIPPING**—The manual removal of unwanted mask, exposing the areas which are to be chemically milled.

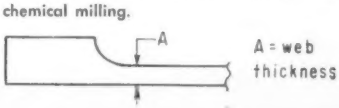
**TAPER RATE** or **IMMERSION RATE**—The rate at which a part is lowered into, or raised out of, the etchant to taper a part.

**TACK-FREE**—On touching the masked part, none of the mask adheres to the finger.

**TRIM AREA**—The excess metal surrounding a part which is to be etched. Tool holes and attachment holes are located in the trim area which is later removed.

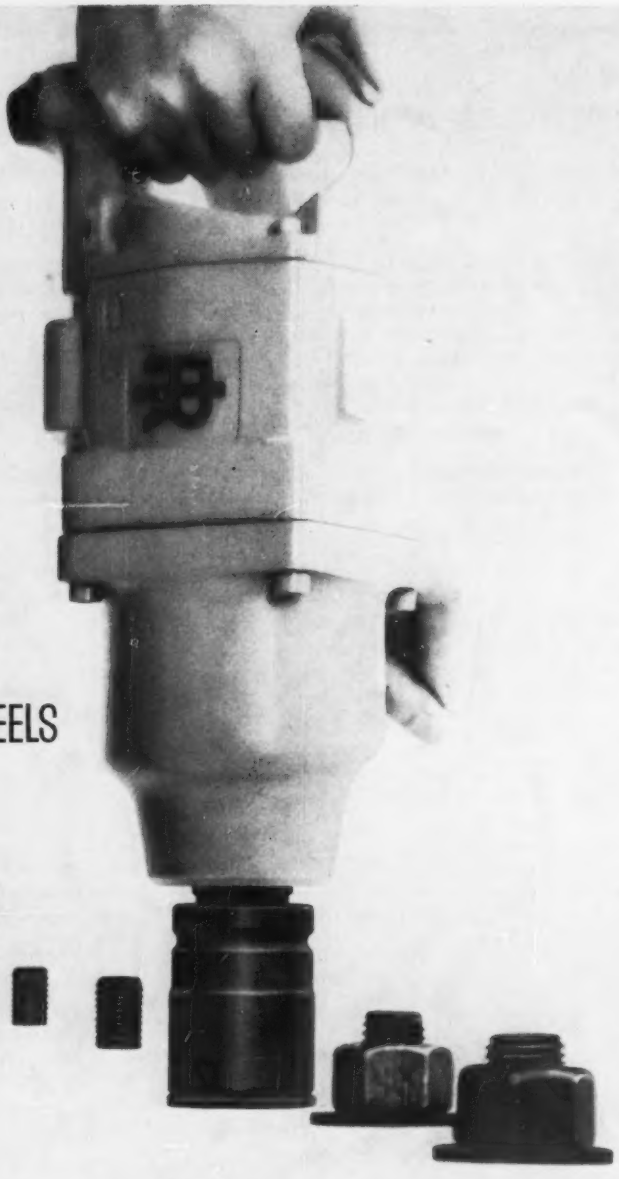
**UNDERCUT**—The distance which the etchant cuts or etches underneath the mask. This is also **A** in the figure illustrating Etch Factor.

**WEB**—The thinned metal remaining after chemical milling.



IMPACT STRENGTH OF
LEAD TREATED STEELS

# TORTURE TESTED



## 3500 TIMES PER MINUTE

Switching to leaded* Aristoloy, Ingersoll-Rand was able to provide the high impact resistance (3500 per minute) and transverse strength required in these hammer case bushings. Use of leaded steel also cut machining time . . . eliminated tearing by the forming tool . . . extended tool life 10% . . . and shortened grinding time. Find out about these free machining lead treated steels—write for LEADED STEELS CATALOG today.

*Inland Ledloy License

ARISTOLOY STEELS

DIVISION OF
COPPERWELD
STEEL COMPANY

ARISTOLOY STEEL DIVISION 4009 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

# Chemical Milling II—workable alloys

## Alloys That Have Been Chemically Milled in Production or Limited Quantities

| ALLOY DESIGNATION | FORM S | P | B | R | Rd | Ex | T | D | F | C | HEAT TREAT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ALUMINUM ALLOYS** | | | | | | | | | | | |
| 1100 | | | X | | | | | | | | As Received |
| 2014 | | | X | X | X | X | | | X | | T4, T6 |
| 2014 Alcad | X | X | | | | | | | | | T4, T6 |
| 2020 | X | X | X | X | | | | | | | T6 |
| 2024 | | X | X | X | X | X | X | X | X | | T3, T4 |
| 2024 Alcad | X | X | | | | | | | | | T3, T4, T81, T86 |
| 2219 | X | | | | | | | | | | As Received |
| 3003 | X | | | | | | | | | | As Received |
| 5052 | X | X | X | X | | | X | X | | | O |
| 6061 | X | X | X | X | X | X | X | X | X | | O, T4, T6, T62 |
| 7075 | X | X | X | X | X | X | X | X | X | | O, T4, T6 |
| 7075 Alcad | X | X | | | | | | | | | O, T6 |
| 7079 | X | | | | | | | | X | | T6 |
| 7178 | X | X | | | X | X | | | | | O, T6 |
| **MAGNESIUM ALLOYS** | | | | | | | | | | | |
| AZ-31 | X | X | X | X | X | X | | | | | O, H24 |
| AZ-91 | | | | | | | | | | X | T4, T6 |
| EK-41 | | | | | | | | | | X | T6 |
| EZ-33 | | | | | | | | | | X | T5, T6 |
| HK-31 | X | X | | | | | | | | X | H24, T4, T6 |
| HM-21 | X | X | | | | | | | | | T8 |
| HM-31 | X | | | | | | | | | | F |
| HZ-32 | | | | | | | | | | X | T5 |
| ZK-51 | | | | | | | | | | X | T8 |
| ZK-60 | X | | | | | X | | | | | As Received |
| **IRON ALLOYS** | | | | | | | | | | | |
| 1010 | X | X | | | | | | | | | As Received |
| 1020 | X | X | | | | | X | | | | As Received |
| 4130 | X | | | | | | | | | | As Received |
| 4340 | X | | | | | | | | X | X | As Received |
| 6434 | X | | | | | | | | | | As Received |
| 301 | X | X | | | | | | | | | Annealed, TH, RH |
| 302 | X | | | | | | | | | | Annealed |
| 304 | X | X | | | | | | | | | Annealed |
| 310 | | | | | | | | | | X | As Received |
| 316 | X | | | | | | | | | | Annealed |

| ALLOY DESIGNATION | FORM S | P | B | R | Rd | Ex | T | D | F | C | HEAT TREAT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 321 | X | | | | | | X | | | | Annealed |
| 347 | X | | | | | | | | | X | Annealed |
| 410 | X | | X | | | | | | | X | Annealed |
| 430 | X | | | | | | | | | | As Received |
| PH 15-7 Mo | X | | X | | | | | | X | | Annealed, RH 950, RH 1100 |
| 17-4 PH | X | X | X | | | | | | | | Annealed |
| 17-7 PH | X | X | X | | X | | | X | | | Annealed, THD, T, (180-200 KSI) |
| 19-9 DL | X | | | | | | | | | | As Received |
| 350 | X | X | | | | | | | | | Any Condition |
| A286 | X | | | | | | | | | | As Received |
| 355* | X | X | X | X | | | | | | | Any Condition |
| Vascojet 1000 | X | | X | | | | | | | | Annealed, 280-300 KSI |
| Chromalloy | | | | | | | | | | | As Received |
| Crucible 56 | | | | | | | | | | | As Received |
| HY-TUF | | | X | | | | | | | | As Received |
| Ladish D6 AC | X | | | | | | | | | | As Received |
| Multimet | | X | | | | | | | | | As Received |
| Thermold J | | | X | | | | | | | X | As Received |
| Tricent | | | | | | | | | | | As Received |
| Circle C | | | X | | | | | | | | As Received |
| Hi-Speed | | | X | | | | | | | | As Received |
| **NICKEL COBALT ALLOYS** | | | | | | | | | | | |
| Inconel | X | | | | | | | | | | Any Condition |
| Inconel W | X | | | | | | | | | | As Received |
| Inconel X | X | X | X | X | | | | | X | | Any Condition |
| Hastelloy | X | | | | | | | | | | As Received |
| Hastelloy X | X | | | | | | | | | | As Received |
| Rene' 41 | X | | X | | | | | | | | Annealed |
| **TITANIUM ALLOYS** | | | | | | | | | | | |
| 2.5 AL-16 V | X | | | | | | | | | | As Received |
| 4 AL-4 Mn | X | X | | | | | | | X | | As Received |
| 4 AL-3 Mo-1 V | X | X | | | | | | | | | Annealed, Aged |
| 6 AL-4 V | X | X | X | | X | | | X | X | | Any Condition |
| 6 AL-3.5 Sn | X | | | | | | | | | | As Received |
| 7 AL-4 Mo | | | X | | | | | | X | | Any Condition |
| 8 Mn | X | | | | | | | | | | As Received |
| Com. Pure | | X | X | | | | | | X | | As Received |

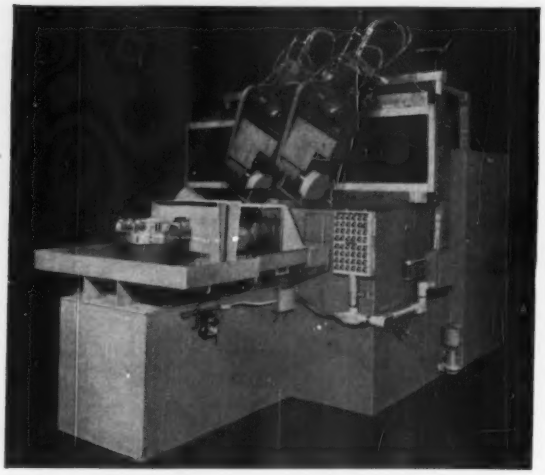
S=SHEET P=PLATE B=BAR R=ROD Rd=ROLLED Ex=EXTRUSION T=TUBE D=DRAWN F=FORGING C=CASTING

✳ Special etchants are currently under development for refractory and exotic alloys.

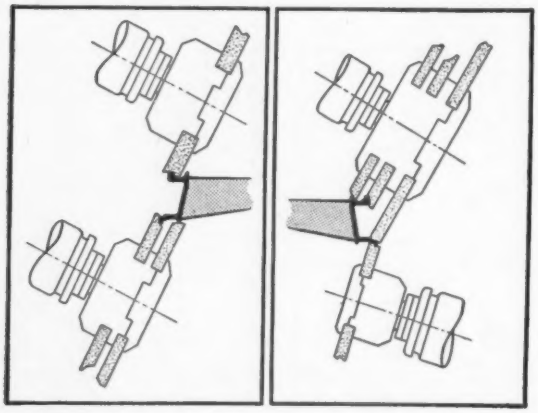
*Cannot pickle prior to chemical milling.

**Turbine blades for jet engines** require such precise accuracy and smooth finish on so many surfaces that the only economical way to grind them in large quantities is *vertically*. In vertical grinding, whether on standard machines or complex specials, gravity works directly for you. The machine does not have to overcome gravity—the result is simplified fixturing and efficient, highly accurate indexing. Single or multiple grinding heads advance to difficult surfaces, grind, then retract for automatic dressing and size control as a new piece is indexed.

# Vertical grinding 19 surfaces efficiently



**Vertical production grinder** shown above is typical of Springfield four-head machines in jet engine plants. An upper and lower head are located at each station. Station operations are shown below.



**Left station** — 7 surfaces ground in one pass.

**Right station** — 12 surfaces ground in one pass.

When high production and accuracy dictate your grinding requirements, it will pay you to investigate the Springfield principle of vertical grinding. The pay-off is also in floor space savings and in the fact that heads usually can be repositioned when part requirements change.

If you would like to know more about the vertical grinding principle, please send for our Bulletin 197-C. The Springfield Machine Tool Company, Springfield, O.

SPRINGFIELD

# Talking Shop

### Diamond Collection

TWO PRODUCTION engineers at Pratt & Whitney Aircraft have made a collection of 75 industrial diamonds with a market value of $2000. Donald Cassada and Elmer Lindstrom selected the stones from among thousands supplied by dealers to serve as a standard for purchase of octahedron (six-faced) diamonds at P&WA. They feel the company is the world's largest user of diamond tools—and its use of them is increasing. The fact that no standards exist for such diamonds led to the collection which contains five quality grades in one carat, one-half carat, and one-quarter carat stones.

### Lo-Ox

LIFE OF GYROS in inertial guidance systems has been increased three or four times by a program started by Frank Archibald and Thomas Elbert at AC Spark Plug. They found that minute amounts of oxygen in the lubricant was a major cause of bearing failures. They get rid of the oxygen by burning it out.

### Vivid

OVERHEARD at an AGMA committee meeting: "It's like trying to separate pepper from fly specks while wearing boxing gloves."

### Wrong Reason

TWO INTERESTING COMMENTS were made on a question from the floor at the recent Industrial Engineering Conference in Pittsburgh. The question was asked: "Is the present tax treatment of depreciation *causing* us to fall behind other countries in mechanization, or is it only being used as an *excuse*?"

Improved tax treatment would be quite a spur to mechanization, said Prof James Bright of Harvard. Spending would probably be completely out of proportion to the tax benefits. Many companies would buy new equipment simply because the tax situation had improved.

Tax treatment is almost irrelevant when we are in a position where we must move ahead to stay even, said Prof Ralph Swalm of Syracuse. However, "with the higher depreciation allowances companies would go ahead and do the right thing for the wrong reason."

### Fast Pickle

AN AUTOMATIC pickle line for magnesium extrusions has been installed by Shwayder Brothers (Samsonite luggage) in Denver. The bright pickle is applied for appearance and to provide tarnish resistance. It finishes the exrusions in a nine-step dipping operation with 12-sec cycles. Some steps last for multiples of the 12-sec cycle and the whole sequence takes 6 min 24 sec.

### Precedent

A FEW MORE WORDS should be said about the Design Development Engineering Division at Motch & Merryweather (*AM/MM*—Oct 16 '61, p79). The division will offer (on a time and material basis) the machine design talents of its engineering staff to design special machinery. The customer can then get bids from machinery builders without the protective padding included by all builders whose bid includes the cost of design work on the jobs they eventually get and on the jobs they don't get but must cover in the ones they do receive.

If that sounds complicated we mean that if you only get half the jobs you bid on, the design work for two jobs has to be charged to one.

Lots of people have been complaining for years about the waste involved in designing six machines in six different companies so one can be built. If M & M's approach spreads it could solve a major financial problem for the builders and reduce the cost of special machines for the users.

### Golden Rule

ONE OF THE MOST UNUSUAL Christmas gifts sent out by a metalworking company is the annual booklet distributed by Autotronics, Inc, Florissant, Mo. The company, much of whose business is with military customers, gives no gifts other than this little annual booklet.

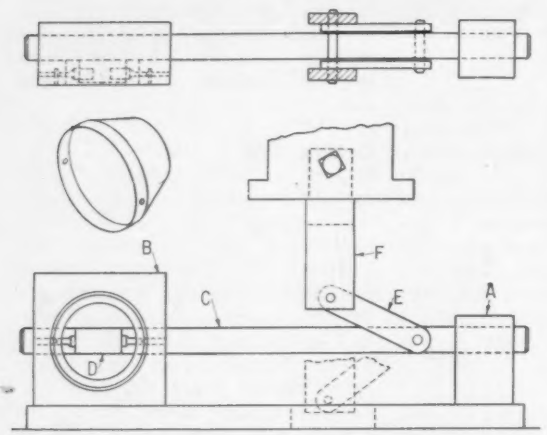
Last year it was on "The Golden Rule" and in a few beautifully illuminated pages described how the Golden Rule turns up in each of the major religions. E F White, president of Autotronics started with 50 booklets five years ago.

By this year, the spreading word has forced him to buy 1000. Each year the booklet deals with a different subject, shows how it is handled by each of the religions.

All this may be pretty far from defense electronics, but it is pretty close to the true spirit of the season. And it seems a good spot for this department to wind up the year with a wish that in 1962 you will only encounter people who believe (as it is said in Hinduism) that "Good people proceed while considering that what is best for others is best for themselves." •

# Practical Ideas

## Side Punching Die for Thin Shells




We had a job that required punching two holes in the lip of thin-walled spun shells and wanted to do it as economically as possible. Here is the die we designed.

Two blocks A and B are attached to a baseplate and have half-round slots in their rear faces to receive the operating rod C. After assembly, a cover plate is attached to retain the rod. Two punches are mounted in a block D which is attached to the operating rod. A hole is bored through B to provide working clearance for this block. A groove is trepanned in the front of block B to accept the lip of the work, the bottom of the groove acting as a positioning stop. A pair of links E connect the rod to the yoke F held in the press ram.

We use a press with a 3-in. stroke, and designed the unit so that, at the top of the stroke, the yoke pin is 1⅛ in. above the rod centerline, and 1⅞ in. below it at the bottom of the stroke. As the ram descends, the rod moves to the right, punching one hole in the lip. As the linkage passes dead center, the rod moves to the left and punches the second hole. When the ram returns to the top, the punches are centralized and the work can be removed.

*C. McLaughlin, Rockaway, NY*

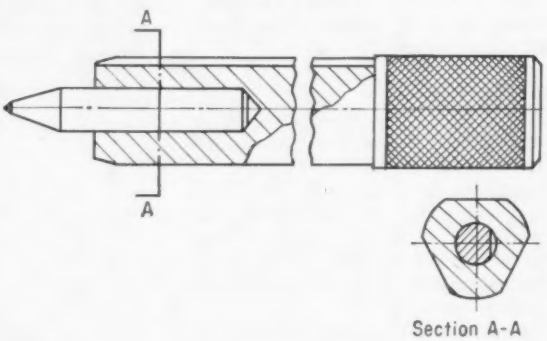
## Transfer Punch Cuts Layout Cost

We had to do a drilling and reaming job on four tube sheets, 4⅛ in. thick and almost 12 ft in diameter. Each had 5058 holes to be drilled and reamed to 1.330 ± 0.002 in. dia. Our practice on smaller sheets has been to lay out and center punch the first sheet, stack it on the second sheet, and then drill through both. Additional sheets were drilled by using the first one as a templet. With this job, however, a pair of undrilled sheets would weigh 18 tons and we lacked the crane facilities for loading them onto the radial drill and shifting them six times to bring different sections within range of the radial arm.

We therefore had to lay out each sheet individually but, rather than have a skilled layout man handle each one, we had him lay out the first one. Then we drilled and reamed it and transferred the hole locations by means of the punch shown here. The holder is tool steel, 1⅜ in. dia and 6 in. long. The head is knurled, and three flats are milled for side clearance. After hardening, the OD was ground to 1.325 +0 –0.001. This gave a minimum clearance of 0.003 in. and, even with the maximum clearance of 0.008 in., centers are transferred and punched more accurately.

The removable point is ½-in. drill rod hardened to RhC 58-59 and is a slip fit in the hole in the end of the holder. A full-length flat allows it to bottom in the hole, and it is readily removed for sharpening. Two unskilled men were able to "lay out" the more than 15,000 holes in three sheets in only a fraction of the time taken for the initial layout.

*C F Brown, Willow Grove, Pa*




### Sleeve Doubles "Mike" Length

Measuring the diameter of large, narrow, O-ring grooves on the inside of a bore can be quite a problem. We solved it by making up a tubular clamp bored to fit over the thimble of two Starrett inside micrometers. The thimbles are inserted with their ends butting against each other and the clamping screws tightened. To use the tool, hold the clamp in one hand and rotate one or both of the spindles. The diameter will be the sum of the readings on both micrometers.

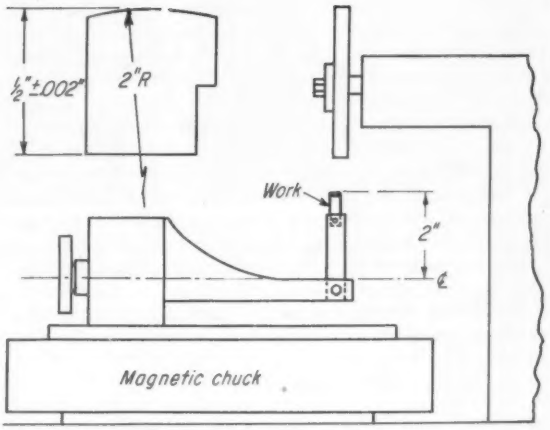
*R E Walker, Lufkin, Texas*

## Dresser Serves as Grinding Fixture

We had to make a lot of pins, about 1000 pieces, out of 5/16-in. dia oil hardening tool steel. A flat was milled on one side, and the top was to be ground to a 2-in. convex radius. The ground face had to remain soft, with no hard spots. Form grinding did not work, as it tended to harden the face, so I needed something that would grind a small amount at a time.

Using a radius dressing attachment as the operating part of the fixture, I made up a work holder to be attached to the arm of the dresser and to grip the work on the milled flat by means of a No. 6-32 screw. Then I set the wheel of a small surface grinder to the correct height to grind to the required length of 0.500 in. ±0.002. While traversing the work across the wheel face I rocked the dresser back and forth to produce the 2-in. radius. The finish produced was excellent and there were no hard spots.

*C A Costigan, Brooklyn, NY*

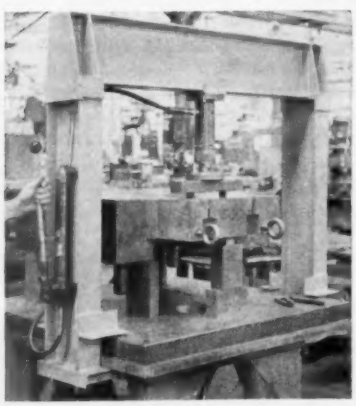



### Jack Aids Die Disassembly

We produce a lot of medium-size die castings in our shop and work with some rather large die housings. During regular maintenance we have had a great deal of difficulty with some phases of disassembly. A cracked sprue bushing or a frozen die pin, for example, can cause a lot of grief.

To simplify the job we made up this rig which fits on one of our iron disassembly tables. It is made from welded I-beams and angles and straddles the table, along which it may be moved for positioning. A 20-ton hydraulic jack attached to the cross beam provides all the power we need to force out the most stubborn parts.

*Ed Genschel, Clark, NJ*



### Dispenser Feeds Plastic Tape

Black plastic electrical tape is quite difficult to peel from the roll, and even more difficult to tear off, especially if you are in a hurry. A handy dispenser can be made from an empty surgical tape dispenser. Separate the two halves, and rewind the paper spool with about 15 yards of electrical tape. Then cement the two halves back together again with ordinary household cement. A loose end is then always available, and the cutoff blade does a neat job.

*Robert Micals, Freehold, NJ*

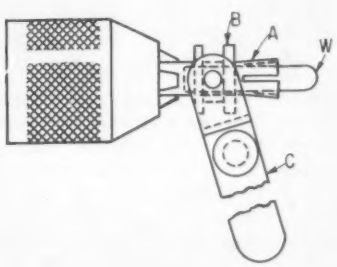
### Simple Collet for Polishing

We had to polish the rounded end of a number of heat-treated pins as cheaply as possible, and the quantity did not warrant tying up a lathe. So we made up this simple collet to do the job.

A piece of tubing, *A*, whose ID is a close slip fit for the work, is slit for a short distance across the end with two crosscuts. The end is then opened up by driving a taper pin into it. A sliding spool *B* is fitted to the straight portion of the tube and is grooved to receive two pins in the forked lever *C*. This lever is mounted on a bracket, not shown.

Instead of a lathe, we used a small drillpress placed on its back on a bench. When the lever is moved to the left, the spool moves to the right and squeezes the split end of the tube onto the work *W*. Because of the stretching by the taper pin, the end is distorted slightly so that when the spool is moved toward the end, the split section will close in but cannot return to its original circular shape. It thus grips the work firmly enough to prevent it from spinning during polishing. We load and unload without stopping the spindle.

*L Kasper, Philadelphia, Pa*



# Practical Ideas

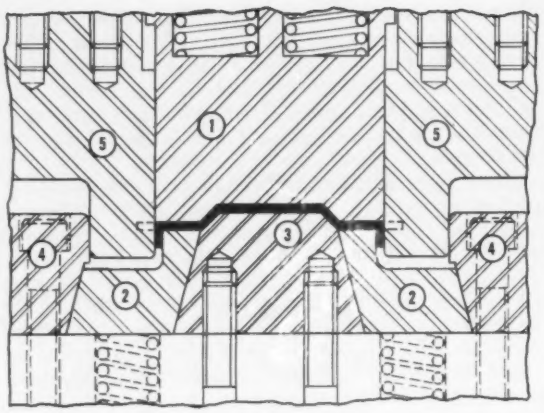
## Bending Die Has Collapsible Formers

At one station of a progressive die we had to bend down two legs on the part, and these would bind on the forming die and prevent the work from advancing to the next station. To solve the difficulty we designed the formers to contract on the upstroke.

The previously cupped part is located over the stake *3*, and the forming blocks *2* are pushed up by their springs along a 15° angle until they bear against stops on the gibs *4*. As the ram descends, the hold-down *1* presses on the work and pushes it and the formers down, thus causing the formers to expand until they bottom. The punches *5* then form the legs down against the edges of the formers.

On the up stroke, the formers rise and contract, thus freeing the work and allowing it to move to the next station.

*B Packer, Shaker Hgts,.Ohio*




### Magnets Hold Stencils

When using regular paper stencils for spraying or brushing lettering or designs on metal objects, you can prevent the stencil from slipping by taping several small permanent magnets to the front face, using ordinary masking tape. These act as a third hand to keep the stencil in place when you have to shift your own hand to a different position. Operation will be speeded up and rejects reduced.

*F. Lettino, L I City, NY*

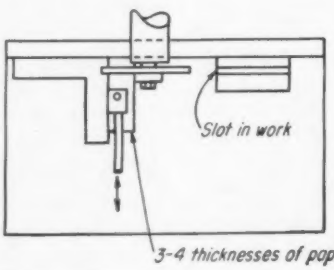
### Guide Aids Wheel Dressing

When grinding a narrow, relatively deep slot, the corners of the grinding wheel will break down, making it necessary to dress the wheel one or more times to produce a sharp corner in the work. After dressing, it is virtually impossible to reset the cross-slide to exactly the former position so that the wheel will plunge down into the work without hitting one side of the slot.

This difficulty can be solved by setting up an accurate square on the magnetic chuck to serve as a guide for the dressing diamond. A handle should be screwed into the diamond holder so this can be moved back and forth against the edge of the square to dress the wheel edge without altering the cross-slide setting.

A piece of fiber or three or four thicknesses of paper must be placed under the diamond holder to reduce the pull of the magnet and allow it to move freely. The final pass of the diamond should always be against the backlash of the cross-feed screw if there is no lock and, of course, the diamond must always be set to the left of the wheel center.

*B Schneider, W Orange, NJ*




### VERTICAL MILL CUTS OIL GROOVE

**Was the winning entry in the Oct 2, 1961 issue.**

**The $25 prize is awarded to:**

**H Koslow, Bronx, NY**

**AN EXTRA $25 will be paid for the best Practical Idea in each issue of American Machinist/Metalworking Manufacturing. All items appearing on the Practical Ideas pages are eligible. In case of a tie, duplicate prizes will be awarded.**

**PAYMENT—will be made as soon as tabulation is completed, and is in addition to the regular rate for the item published.**

**JUDGES—are a group of American Machinist/Metalworking Manufacturing readers who select articles they prefer in a particular issue. The group changes entirely with each issue and thus represents a true cross-section of readers. Their decision is accepted by the editors, without reservation or bias, as final in each case.**

**REQUIREMENTS—Items must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with AM/MM standards, and readers will judge only the finished product—in terms of its usefulness to them.**

**WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.**

**HOW TO ENTER—Send all entries to: Practical Ideas Editor, American Machinist/Metalworking Manufacturing, 330 W 42nd St, New York 36, NY. Please make sure that your name and address are included.**

# Names in the News

**Pratt & Whitney Co,** West Hartford, Conn, has elected **Daniel C McCarthy** president. The new president joined the firm in 1960 as administrative vice president and was elected executive vice president in February. Since April, following the resignation of Jacob J Jaeger, he has been chief operational officer

**Clearing Division of U S Industries, Inc,** Chicago, has appointed **E J Baumrucker** (left) executive vice president in charge of domestic operations. Mr Baumrucker was at one time in charge of Clearing's Detroit and London sales offices and, most recently, was vice president and general sales manager of the division. **E P Cunningham** (right), formerly vice president, has been appointed vice president in charge of international operations for Clearing. For the last five years he has traveled extensively abroad to set up export markets for Clearing's lines of presses and metalforming equipment

**Gisholt Machine Co,** Madison, Wis, has announced the retirement of **Harvey A Waddell,** vice president and treasurer, after 36 years of service with the firm. Mr Waddell has also resigned his position as a board member because of ill health.

**Fenn Manufacturing Co,** Newington, Conn, has elected **Wilson L Fenn** chairman of the board and **James P Gantley** vice chairman. Mr Fenn will continue as president.

**Bullard Co,** Bridgeport, Conn, has elected **Thomas H Wilber** secretary of the company. Mr Wilber is purchasing agent of Bullard and manager of the Bullard-Dunn Division.

**DeVlieg Machine Co,** Royal Oak, Mich, has named **S W Meyers** works manager. He was formerly assistant general manager of World Tool & Engineering Co, Minneapolis.

**Burgmaster Corp,** Gardena, Calif, has promoted **William McAvay** from general sales manager to vice president, sales. **John Morris,** formerly midwest regional sales manager, has been appointed sales manager with headquarters in Detroit.

**Di-Acro Corp,** Lake City, Minn, has appointed **Ford C Marquis** general sales manager. He has been eastern district sales manager for the past eight years.

**Westinghouse Air Brake Co,** Wilmerding, Pa, has appointed **Myron Hawley** manufacturing manager of

*(continued on p94)*

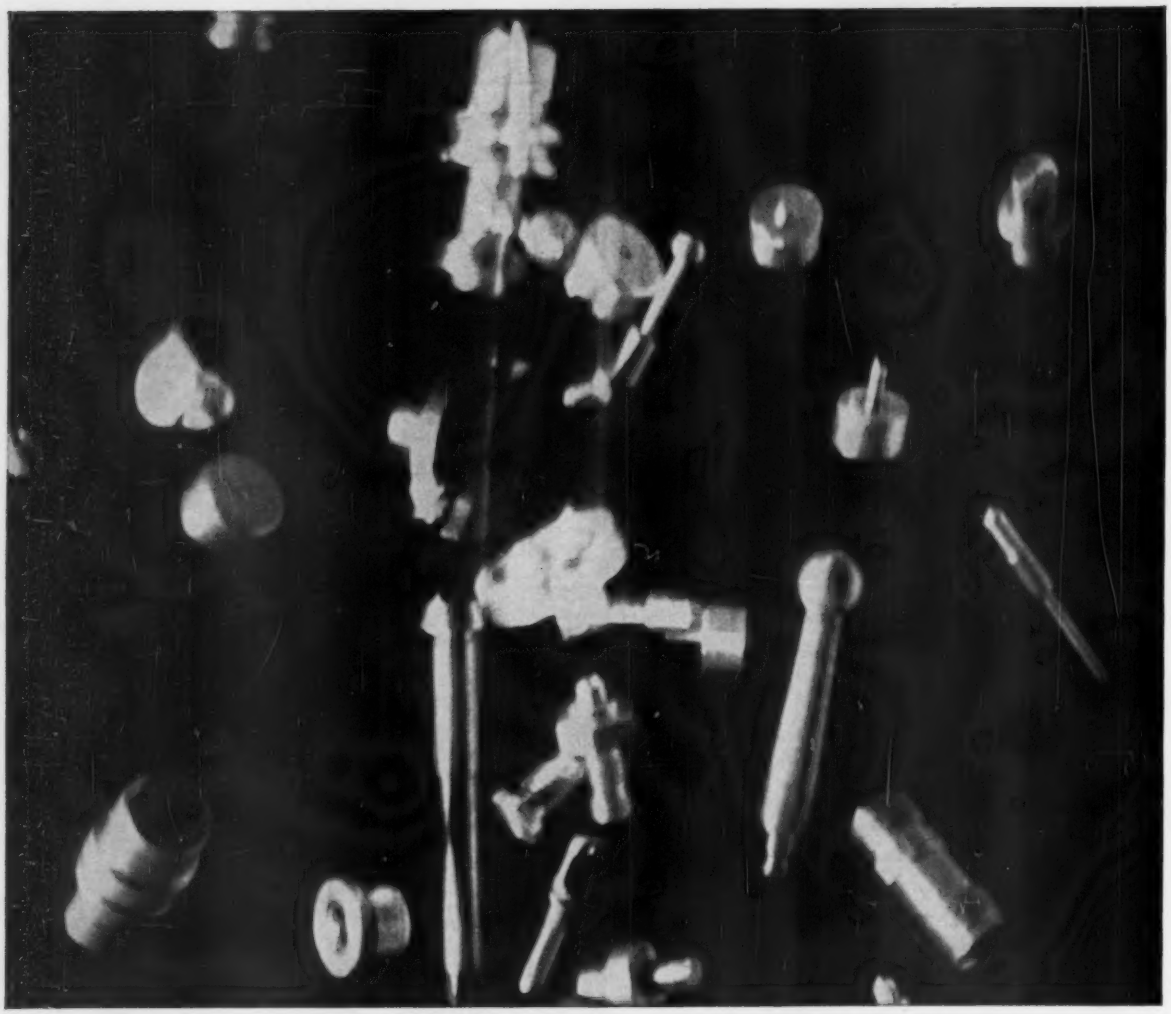
**W Kent Mathias**

**John E Lynch**

**Robert C Bevis**

**James A D Geier**

**Cincinnati Milling Machine Co,** Cincinnati, has named (top left) **W Kent Mathias** general sales manager; (top right) **John E Lynch,** domestic sales manager; (bottom left) **Robert C Bevis** manager of the company's Milling Machine Division; and (bottom right) **James A D Geier** manager of the Grinding Machine Division. Mr Mathias and Mr Bevis are vice presidents of Cincinnati Milling & Grinding Machines, Inc. Mr Lynch was manager of the Cincinnati sales office and later manager of the New York field engineering office. Mr Geier has been serving as vice president and general manager of Cincinnati Lathe & Tool Co, an associated company



# INCREASE PRODUCTION AS MUCH AS 33%

## The "Cleartex Cure" ends the dilution problem forever . . . prolongs tool life ...decreases rejects and downtime...and boosts production by as much as 33%

It's seven chances out of ten that lube oil is leaking into the cutting oil sumps of your automatics right now. Diluted cutting oil means shorter tool life, more rejects and downtime—and sharply curtailed production.

**How a "Cleartex Cure" works.** A "Cleartex Cure" stops this dilution problem cold. Your production can jump as much as 33%. Here's why: Cleartex Oil—heart of a "Cleartex Cure"—is used in *both* cutting and lubricating sumps. It works as a hydraulic fluid, too. Cutting oil strength is always full—regardless of leakage. Because of minimized losses and increased production, *you can actually slash per-piece production costs as much as 40%.*

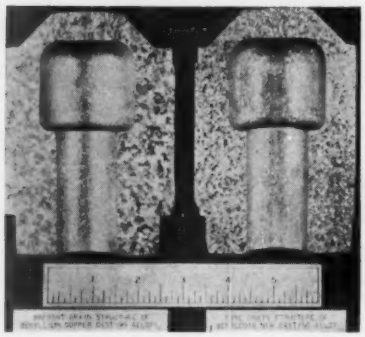
**How to take a "Cleartex Cure."** Getting the full benefits of a "Cleartex Cure" is easy. An experienced Texaco engineer will survey your automatic set-up. He'll tell you which machines will benefit from Cleartex. Our illustrated booklet, "Cleartex in Automatic Screw Machines," spells out the benefits of a "Cleartex Cure" in detail.

To get your copy, plus the survey, contact the nearest of more than 2,300 plants distributing Texaco Products, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. AM-130.

Tune In: Huntley-Brinkley Report, Monday Through Friday—NBC-TV

**TEXACO**

*Throughout the United States*
*Canada • Latin America • West Africa*



## Berylco Refines Grain Structure in Beryllium Copper Casting Alloys

Grain structure of beryllium copper casting alloys have been improved with a new method developed by Berylco. Castings made from the fine grain casting alloys (right) offered by the company are said to have improved mechanical properties, better surfaces after machining and polishing and will exhibit a higher degree of grain uniformity in both thick and thin sections. Also, distortion of cast parts is said to be reduced as is the possibility of cracking during solution heat treating and aging.

Alloys that will be available with the new fine grain property include the company's 20 CR, 165CR, and 275 CR alloys. The new development will be introduced without any addition in price.

*The Beryllium Corp, Reading, Pa*

MORE DATA? Circle 81, inside back cover

## Improved Electrolytic Compound Retards Grinder Corrosion

Formula No. 3 retards corrosion to electrolytic grinding machines and tools while accelerating the cutting process. It is effective in materials removal processes where molecules of solid materials are disassociated from the solid and carried off in the electrolytic salt solution. The major difference between the Formula No. 3 and older electrolytic salts on the market is said to be the absence of sodium chloride in the new formulation. The salt is reportedly suitable for use with stainless steel and the newer exotic metals.

*Compounded Chemicals Co, 11500 Wright Rd, Lynwood, Calif*

MORE DATA? Circle 82, inside back cover

## Copper, Brass Silver-Brazing Pastes are Less Corrosive

A new silver brazing series, the S-5 series, said to be less active than other silver brazing fluxes are designed to be used on non-ferrous metals (except aluminum) and parts where the normally corrosive silver brazing fluxes cannot be removed. They are also recommended for applications on parts requiring a large fillet of silver braze material. Typical applications are brazing of electric hot water heating elements, electronic connectors, electric frying pans, heating and cooling coils and brass fittings. Prices are said to be competitive with other silver brazing materials.

*Fusion Engineering, 17921 Roseland Ave, Cleveland 12, Ohio*

MORE DATA? Circle 83, inside back cover

## Rhenium Plating Solution Gives Extreme-Heat Resistant Coating

New electroplating solutions for use with the company's table top plating system include a rhenium solution for electrical equipment that must withstand extreme temperatures. Rhenium, with the highest melting point (5,732 F) of any platable metal is deposited with a density of 20.5 g per cc, second only to platinum. Also it has a stable contact resistance, low arc erosion, and resists tarnishing. The table-top system of selective plating allows a specific area to be plated without dipping the entire component. One lead from a power pack is attached to the component and the other to a cotton swathed stylus anode. The stylus is dipped into the rhenium solution and rubbed gently over the area to be plated.

The company also has available for this system, ruthenium- and 700-brinnel nickel-tungsten-alloy-solutions.

*Selectrons, Ltd, 253 E 26th St, New York 10, NY*

MORE DATA? Circle 84, inside back cover

## Mystik Strapping Tape Has Tensile Strength of 320 lbs

Semi-transparent strapping tape, designated Thin-Scrim, has a tensile strength of 320 lb and can be used in applications formerly requiring steel strapping. The tape is backed with woven glass webbing instead of monofilaments so that it has bi-directional reinforcement. The waterproof tape will not mar parts or cartons as steel tape sometimes does, and it is easy to apply and strip off.

*Mystik Adhesive Products, Inc, 2635 N Kildare Ave, Chicago 39, Ill*

MORE DATA? Circle 85, inside back cover

## Rust Preventative Compound Gives Full Year Outdoor Protection

Up to a full year's outdoor rust protection is provided by this new clear compound called SF-3834. Under test conditions a film thickness of 0.00125 in. was said to pass a 10-day salt spray, a 100-hr weatherometer and long term humidity test without breaking down. The compound's fast drying solvent carrier also exceeds the underwriter's minimum for flash point.

*Kerns United Corp, 824 State St, Calumet City, Ill*

MORE DATA? Circle 86, inside back cover

## Cold Stripper Removes Epoxies, Japans, Wrinkles and Enamels

Fidelity No. 931 epoxy and general purpose stripper is a specially formulated stripper for removal of epoxy coatings, japans, wrinkles and baked enamels. It may be used on aluminum, steel, copper, brass and is non-flammable and cold working. Pieces to be stripped are immersed in the liquid at room temperature until the coating is disintegrated. The stripping is followed with a water rinse.

*Fidelity Chemical Products Corp, 470 Frelinghuysen Ave, Newark 14, NJ*

MORE DATA? Circle 87, inside back cover

| | |
|---|---|
| Spindle Speeds | INFINITE (from 43 to 3500 RPM) |
| Horsepower | CONSTANT |
| Torque | HIGH |
| Finish | ULTRA-SMOOTH |

An exclusive coaxial spindle design combined with a unique, beltless-type, mechanical variator drive unit (5 HP), enables the Micro-Turn Lathe to deliver constant horsepower throughout entire speed range, actually maintaining drive speed output within two-tenths of one percent. Built-in torque responsive mechanism positively prevents slippage even under starting or shock loads. Maximum torque is assured at low speeds for heavy cutting, with super-smooth operation at highest speeds for ultra-fine finish, all complemented by the Micro-Turn's rigid construction and supreme balance.

Features include:

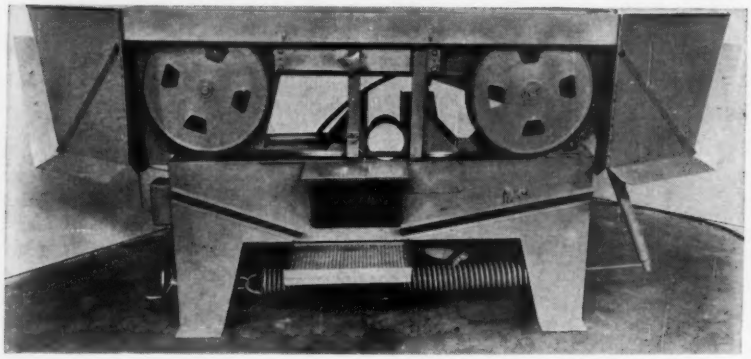
- pushbutton control with direct reading tachometer
- spindle speed ranges changed by pushbutton . . . without stopping spindle
- exclusive feed converter unit, located in apron, providing simple conversion from standard to optional feed ranges without affecting standard thread ranges
- double-wall, one-piece, totally enclosed apron
- fail-safe pressure lubrication to headstock, gear box and end gearing
- pressure lubrication to carriage and cross slide ways provided by pump located in apron; one-shot plunger to lubricate cross slide ways when carriage is stationary
- choice of manual or automatic coolant operation
- hardened and ground leadscrew, cross feed screw and compound rest screw

For the complete, illustrated story on the revolutionary MICRO-TURN, write today for your copy of Bulletin No. 222. Nebel Machine Tool Corporation, Lathe Division, 106 S. Cooper Ave., Cincinnati 15, Ohio.

# NeBEL
## MICRO-TURN*
### HIGH SPEED PRECISION LATHE

*TM Reg. U.S. Pat. Off.

CIRCLE 300 READER SERVICE CARD



## DoAll Bandsaw is Accurate to 0.002 Inch Per Inch of Diameter, Costs Under $1,000

The new C-6 heavy duty bandsaw, which sells for under $1,000 retains the accuracy (0.002 in. per in. of diameter) of the rest of the company's power saws. The combined low price and high accuracy are made possible by several innovations in bandsaw design.

• The machine has extra large wheels for its cutting capacity. This cuts wear due to bending of the blade in order to bring it square with the work. To further reduce blade fatigue the wheels are set extra far apart.

• Stressed skin box construction gives rigidity without massiveness and the new design is especially developed to take advantage of the company's Dart blade. The Dart blade has hardened teeth and a spring-tempered back which allows the use of 50% more tension than with normal blades. In this model the box construction is so arranged that increased band tension compresses rather than distorts the head yoke.

• Coolant and hydraulic system are combined. Since hydraulic power is needed only when raising the cutting head and coolant is needed only when feeding the work, the two systems have been combined and are controlled by a 2-position ("coolant on" and "head up") lever on the left-hand saw guide. The rate of descent, in addition to being controlled by a spring that counterbalances the weight of the head, is checked by the flow of coolant fluid from the hydraulic fluid cylinder when the lever is in the "coolant on", or cutting, position.

• The drive shaft is also the cutting head hinge shaft. This, besides cutting costs, eliminates faltering and sticking of the head descent since the hinge shaft is always rotating when the machine is feeding. In addition, because the drive shaft is also the center of rotation of the cutting head, the spur gear that is connected to the driven carrier wheel is accurately in mesh with the drive pinion for all positions of the cutting head.

The machine is driven by a 1-hp motor through four-step balanced pulleys which provide the four most useful speeds for this model. Speeds are 65, 90, 130, and 180 fpm. Capacity of the machine is 12 by 16 in. and cutting speed with the Dart blade in mild steel is 7 sq in. per minute. The saw can also be fitted with the Demon high speed steel blades for difficult-to-cut metals or it can use regular carbon alloy steel blades.

*The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill*

MORE DATA? Circle 51, inside back cover

## GE Electro-hydraulic Units Offered In 12,500 to 50,000 Joule Sizes

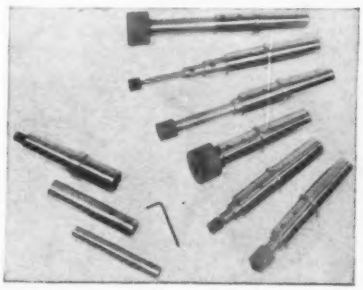
This electro-hydraulic system for forming hard-to-work metals with electric arc discharges (*AM/MM* Mar 6 '61 p 80) is now being offered in a standard line of metal forming equipment. The equipment is offered in four ratings from 12,500 joules to 50,000 joules stored energy and consists of a charging power supply, a capacitor energy storage module, a firing switch and instructions for operation. Optional features include: an enclosed triggered gap firing switch for synchronizing the firing with other equipment or where multiple energy storage banks must be switched simultaneously, and automatic charging and firing systems.

The company offers as additional equipment an arc electrode assembly for immersion in a water tank and a shunt for discharge current measurement. A vacuum system is also necessary to remove any air or water vapor that may enter the space between the part and the die. The company will assist in selecting suitable vacuum equipment.

Charging power supply for the units requires an input voltage of 220/440 or 115/230 volts single phase 60 cycles. Capacitance of the units ranges from 62.5 to 250 microfarads and prices range from $11,000 to $26,000.

*General Electric Co, High Voltage Specialty Transformer Section, Holyoke, Mass.*

MORE DATA? Circle 52, inside back cover



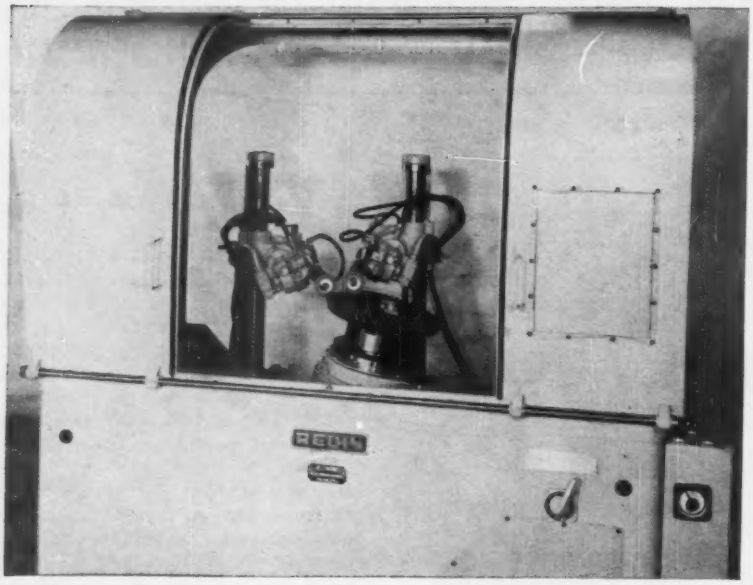
## Telescoping Tool Developed For Internal Grinding Jobs

Tele-Quill replaces dozens of individual quills. Main body stays in the spindle permanently, eliminating spindle wear. All changes for different lengths or sizes are made in seconds, using the adjustable telescoping sleeves with locking setscrews.

These hardened, ground and lapped, rigid tools are designed for long runs as well as for quick-change short runs. They are made by Yale Tool & Engineering Co.

*Dist by Nu-Tool Sales Co, 17227 W McNichols Rd, Detroit 35, Mich*

MORE DATA? Circle 53, inside back cover




## Universal Deburring Machine Handles Gears up to 40-in. Dia With Hood Removed

Model 32 Universal gear deburring machine will deburr and chamfer spur, helical, straight bevel, and spiral bevel gears as well as splines, sprockets, and odd shapes.

With the hood in place the machine will accommodate gears up to 32 in. diameter and with the hood removed gears up to 60 in. diameter can be handled. The work spindle will support a load of 8,000 lbs.

Gear face capacity on both internal and external gears is 6 in. and minimum diametral pitch capacity is 16.

Maximum wheel size for the machine is 4 in. and the wheel speed is 11,000 rpm.

*Redin Production Machine Co, 2433 20th St, Rockford, Ill*

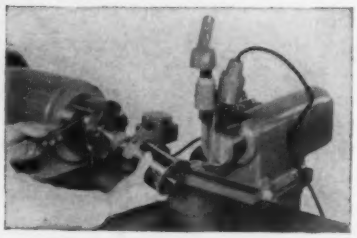
MORE DATA? Circle 54, inside back cover

## Sheffield Adds Low-Cost Air Gage to Precisionaire Line

Slim Jim Precisionaire gage weighs 5 lbs and stands 18 in. tall and can be used with existing tooling such as Airejet spindles, Airsnaps, and Plunjet gaging cartridges. Standard amplification is 1000, 2000, 5000, or 10,000 and the price is the same for each. Standard conversion kits permit changing for from one amplification to another in a minute or two. Measurements checked with the gage include height, width and depth, internal and external diameters, flatness, and concentricity. Price of the unit is $149.50, FOB Dayton, Ohio.

*The Sheffield Corp, Dayton 1, Ohio*

MORE DATA? Circle 55, inside back cover



## Adapter Allows Depth, Diameter Pre-Setting of Cutting Tool Edges

The adapter shown above makes possible depth and diameter precision presetting of cutting tool edges, where there is a straight shank mounting, on the DeVlieg cutting tool pre-setting machine using an illuminated microscope with a special cross-hair reticle.

The adapter, known as Hydra-Lock, has a hydraulically actuated chuck which clamps the straight shank of a boring bar or tool holder. Even pressure with hydraulic gripping action maintains lengthwise position and eliminates tool moveout. Total indicator runout is said to be within 50 to 75 millionths.

This accuracy is accomplished with a screw-activated captive hydraulic system that collapses a precision steel bushing enough so that it centers and clamps the straight shank. When pressure is released, a slip fit permits easy entry and removal of boring bar or tool holder.

*A & C Engineering Co, 12024 E Nine Mile Rd, Warren, Mich*

MORE DATA? Circle 56, inside back cover

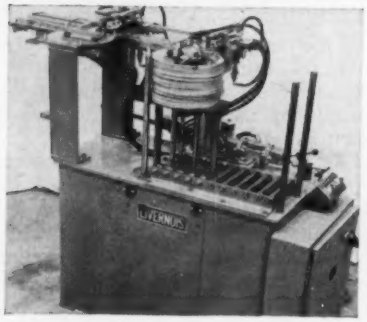
## Linde Natural Gas And Propane Cutting Nozzles Give Fast Starts

Oxweld 1543 series nozzles are recommended for scrap cutting, beveling, piercing, or cutting of heavily rust - and - scale - encrusted plate up to 30-in. thick. The nozzles are said to give high preheat for faster starts with natural gas and propane. The faster starts are the result of the nozzle's greater preheat slot depth which gives higher volumes of preheat gases, increasing heat content. With the proper preheat gas ration (2 to 1 natural gas to oxygen, 4 or 4½ to 1 propane to oxygen) pierce preheat starts are achieved in only 5 seconds.

Six nozzles are available for cutting thicknesses from ½ to 30 inches. They are designed for use with Oxweld C-31, C-32, C-66, and C-67 cutting torches.

*Linde Co, 270 Park Ave, New York 17, NY*

MORE DATA? Circle 57, inside back cover



## Livernois Press Feeder Handles Thin Stock Without Scratching

Round or irregular shaped blanks of any material are separated and fed into a die by this univeral blank feeder. The loader is especially adapted for thin gage stock which is handled by a vacuum actuated pickup and separating feature that works on nonferrous as well as ferrous materials without scratching. The "idle" or second station on this unit is used as a secondary safety. If a double blank gets into the second station the unit will automatically stop the press and feeder and flash a warning light for the operator. The unit can also be used as a press unloader to remove pieces from a die and stack them automatically.

*Livernois Engineering Co, 25200 Trowbridge, Dearborn, Mich*

MORE DATA? Circle 58, inside back cover

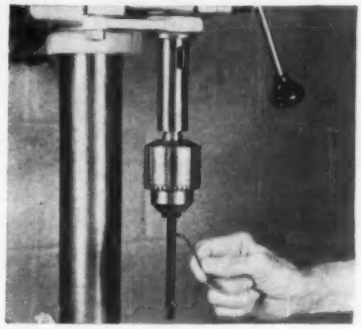
## Tap Chuck's Compensating Driver Eliminates Tap Slippage

Compensating positive drive on Model '09 tap chuck handles all sizes of taps within the range of the chuck. Driver consists of a slotted bar free to shift within the body of the tap chuck. Setscrews at each end of the bar grip the square shank of the tap in the slot. The tap is thus held rigidly and in perfect alignment with the machine spindle by the collet, but positive drive is provided by the driver. Collets employ the Erickson double-angle design which assures concentricity to within 0.0005-in. TIR.

Model is available in three sizes: EO9 accepts taps from 0 to ¼ in.; FO9 has range of 0 to ⅞ in.; GO9's range is ½ to 1½ in. The tap chucks are available with shanks for any spindles.

*Erickson Tool Co, 34350 Solon Rd, Solon, Ohio*

MORE DATA? Circle 59, inside back cover



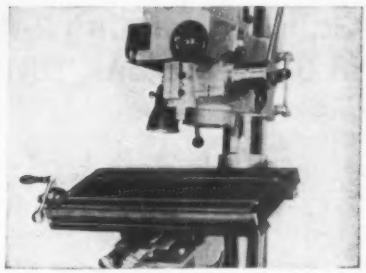
## Cogsdill's Burraway Tool Features Improved Design

Style E Burraway for deburring and chamfering both sides of a hole in one operation is now made up of only four parts instead of the former eight. Improvements include easier blade change and easier adjustment.

The tool, which now consists of a mandrel, blade, spring, and setscrew, can be chucked in any conventional spindle and parts can either be fixtured or, in many cases, hand-held. Amount of stock removal can be adjusted by means of the setscrew which determines the spring tension; setscrew can be adjusted while the tool is in the spindle. Burraways are available in 1/32-in. increments for hole diameters from 3/32 to 1 in. Intermediate diameters can be furnished from next larger size. Sizes larger than 1 in. dia can also be furnished on order.

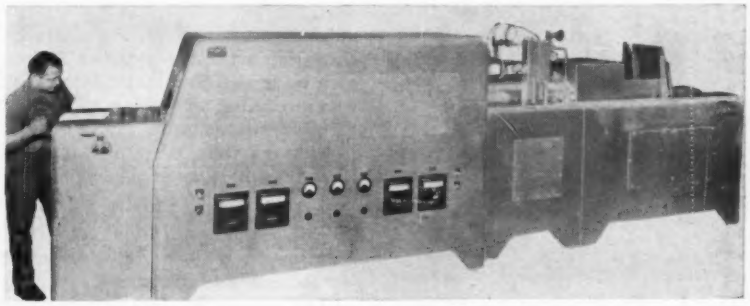
*Cogsdill Tool Products Inc, 12980 W Eight Mile Rd, Oak Park 37, Mich*

MORE DATA? Circle 60, inside back cover



TILTING TRUNNION attachment, used with a simple adaptor renders the companies 14 by 14-in. work tables tiltable in the 18, 24, and 25½-in. drill press lines—*Boice Crane Co, 935 W Central Ave, Toledo 6, Ohio*

MORE DATA? Circle 61, inside back cover



## Hayes Electric Furnace Has No Muffle, Retains Bright Finish on Steel Parts

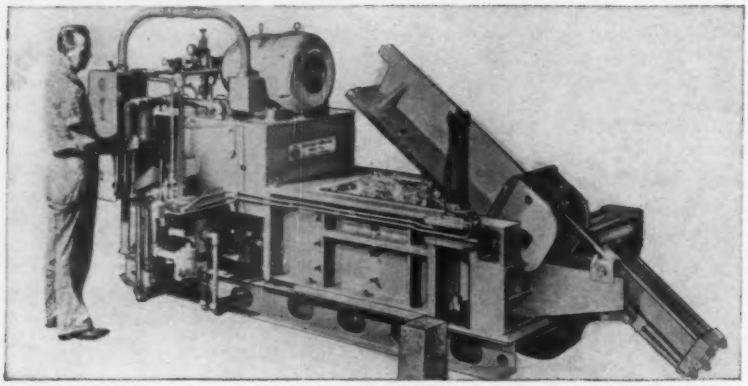
"No muffle" construction of this 2350 F furnace is made possible by the use of high purity refractory materials plus heating elements that operate without deterioration in nitrogen, dissociated ammonia or endothermic atmospheres. The furnace, known as Model FEC, has the ability to heat up to temperature rapidly without excessive loss of power and can also stabilize quickly at the low atmosphere dew points required to produce bright hardened work.

Output from the Model FEC is said to be bright and clean and ready for tempering without secondary grinding or finishing.

High speed steels of the 18 4-1 class, stainless steels, high chrome, high carbon steels and cold header stock can all be treated in the furnace and problems of carburization or decarburization are reportedly eliminated.

*C I Hayes Inc, Cranston, RI*

MORE DATA? Circle 62, inside back cover



## Galland-Henning 2-Ram Press Bales Scrap In 3 Dimensions, Discharges Automatically

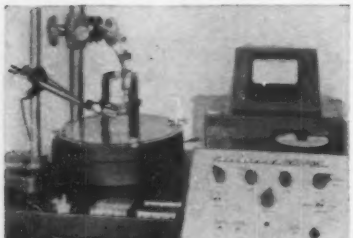
Triple compression baling for the cost of a two-ram press is one of the important features of the Model 12 DC baling press. The third dimension in the baling operation is provided by a tramper cover that exerts a 28-ton compressing force on scrap loaded in and above the baler box. After the cover action reduces the scrap volume by one half, the first, and then the second, compression rams move in, each with 50-tons of force to finish forming the bale. The second compression ram pushes the finished bale through a discharge opening so that the operator does not have to lift the bale. The complete cycle takes only 50 seconds.

Scrap bales produced by the press can be either 5 by 12 by 5 in. or 6 by 12 by 6 in., and finished bales made from steel chips weight from 30 to 40 lbs.

The baler can be fed by an overhead conveyor, a second floor chute, or equipped with the company's preloading hopper.

*Galland-Henning Mfg Co, Milwaukee 46, Wisc*

MORE DATA? Circle 63, inside back cover



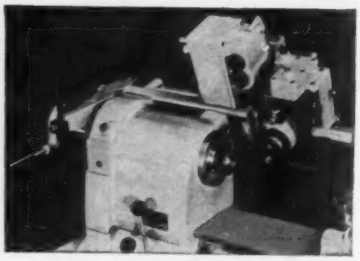
## Cleveland Indi-Ron Gage Gives Measurements to 3 Millionths

The Indi-Ron makes possible measurements to 3 millionths of roundness, concentricity alignment, squareness, or flatness. This is possible because the part is rotated while the gage head remains stationary so that the reference point is the axis of the precision spindle on which the part is held. The spindle has accuracy of 3 millionths or less.

The axis is aligned exactly with that of the spindle on which the part is supported by means of a 4-point centering and tilt adjustment table. With the part aligned, a trace or traces are made on the polar coordinate graph recorder which is synchronized with the spindle. A true picture of the part is thus obtained accurate to 0.000003 in. Standard turntable capacity on the Indi-Ron is 6 in. and weight load maximum is 75 lbs. Spindle speed is 4 rpm.

*Cleveland Instrument Co, Cleveland 31, Ohio*

MORE DATA? Circle 64, inside back cover



## Hardinge Offers Fully Automatic Threading Unit for Chucker

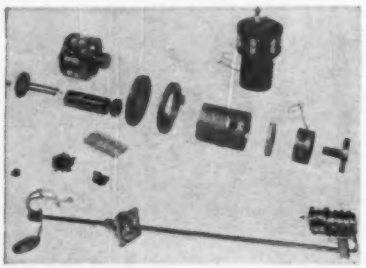
New fully automatic threading unit goes through the same threading motions as the previous manually-operated model threading unit. It has a lead screw mounted directly on the headstock spindle and a mating follower. There are no intervening gears so that accurate duplication of the precision lead screw is assured.

In operation the operator moves the carraige to the right hand end of the bed after the work has been bored, turned and other operations completed. He then swings the threading head into cutting position and pulls the starting knob. Operation of the air-actuated and electrically controlled unit is then fully automatic.

The threader is available with new chuckers or as a separate attachment for existing machines.

*Hardinge Brothers, Inc, 1420 College Ave, Elmira, NY*

MORE DATA? Circle 65, inside back cover



## Small Electron Beam Gun Mounted On Ball Joint for Easy Positioning

Model SEL 113-A electron beam scource gun is a small cylindrical water-cooled unit mounted on a universal ball-joint vacuum seal to give optimum mobility and positioning characteristics. It is designed for 10,000 to 17,500 volt and up to ½-amp operation.

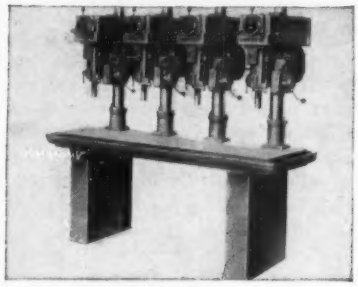
A single tungsten wire loop directly heated is the electron emitter and a cathode curved electrode surface is spaced approximately 0.60 from a water cooled anode. The cathode and anode electrodes are designed to provide uniform electrical field lines leading to a focal spot some distance in front of the scource aperture. A thin lens electro-magnet focusing coil is used to direct the electron beam inward to achieve a closer focal point. Adjustment of the current in the focusing coil allows spot size focusing at any fixed distance in front of the scource aperture.

Some features of the gun are: small size (2½ in. OD by 4 in. long) no shielding necessary, and ball joint mounting that allows push pull rotary motion through a full 90 degree cone. Matching power supplies are available as 1, 2, and 7.5 KW rating.

These supplies are composed of three separate modular units that are interconnected by control cables to give the integrated supply—control, high voltage, and focus.

*Scientific Engineering Laboratories, P O Box 607, Woodland Calif.*

MORE DATA? Circle 66, inside back cover



## Clausing Multiple-Spindle Drills Have 7/8-in. Capacity in Steel

Production rated capacities of the company's new 20-inch three- and four-spindle drills are 1⅛ in. in cast iron and ⅞ in. in steel. The drills are available with a choice of two heavy duty countershaft drives: a positive power variable speed drive that allows speed changes while the drill is running and step pulley drives with five or ten speeds. Speed ranges are from 150 to 2000 rpm.

Outstanding features include: choice of gear-driven power feed or hand feed, 4 in. ground steel columns, and 85½ by 29½ in. tables with tops ground square with each spindle to within 0.005 in. in a 12 in. circle.

Distance from column to center of spindle is 10 in., and from column bracket to center of spindle, 9¼ in. Spindle travel is 6½ in. and maximum distance from spindle to table is 25-15/16 in.

*Clausing Division, Atlas Press Co, 2402 N Pitcher St, Kalamazoo, Mich*

MORE DATA? Circle 67, inside back cover

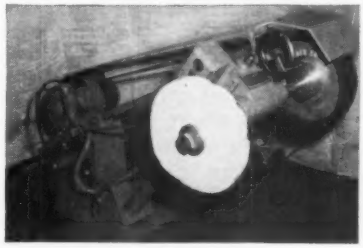
## Detailed Ductility Evaluations Made By Combination Device

Evaluation of deep drawing properties can be made in greater detail than previously possible with the Ductomatic Sheet Metal Tester and XY Electronic Recorder combination. With these units, continuous load vs depth of cup curves can be plotted for any Olsen cup (indentation) test, deep draw cupping test, or deep draw hole expansion test.

Any one of three ductility load range capacities can be selected with the flip of a switch to obtain maximum recorder pen motion. In the case of Model BP-512 Ductomatic (pictured) the range capacities on the recorder are 30,000, 15,000, or 7500 lb (full, ½, and ¼ capacity). Three cup depth measuring ranges are also available in the ratio of 1:1, 2:1, or 4:1, representing, respectively, full chart scale rotation for cup depths of 4, 2, and 1 in., or any other factory-set series of increments. Available in capacities from 12,000 to 70,000 lb, any Ductomatic can be furnished with an XY Electronic Recorder.

*Tinius Olsen Testing Machine Co, Easton Rd, Willow Grove, Pa*

MORE DATA? Circle 68, inside back cover



## Heavy-Duty Belt Grinder Is Multi-Purpose Machine

Versa-Jack Model JS 3132 has a built-in backstand with tracking and tension controls at operator's finger tips. Abrasive belt capacity is up to 3 in. wide and 132 in. long. Adaptors and attachments to the free end power shaft, opposite the main driving head, permit buffing, wire brush, tongue and yoke sanding, spindle, disk, and internal grinding operations.

Unit also features a removable idler, allowing the operator both contact and free belt, straight or contour grinding in one handling. Stand-up or sit-down positions are possible.

*Bush Mfg Co, 900 Rochester Rd, Clawson, Mich*

MORE DATA? Circle 69, inside back cover

## Cunningham Circular Part Marker Imprints Parts in One Second

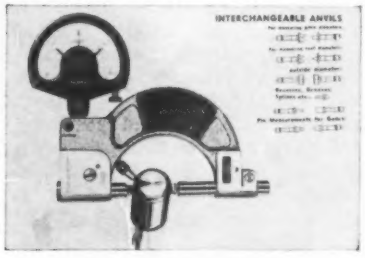
The Go-Rounder marking machine will mark circular parts on a production basis, stamping as many lines of type as desired around the circumference of the part. Basic assemblies of the unit are: a revolving index table, with six arbors for the parts, a marking roll with replaceable type, an electric motor with controls for turning the marking roll and pneumatic controls for revolving the table. A screw adjustment is also included for controlling the depth of the markings.

In operation the part is positioned on the arbor, air pressure rotates the table 60 degrees to position the part under the marking roll while tripping a solenoid switch to engage the motor. One revolution of the roll marks the part and the friction fit of the part on the arbor prevents distortion during marking. At this point air pressure has built up again to revolve the table and repeat.

Production speeds can be regulated from one part every 4 seconds to one part every second. When setting up for marking each arbor can be positioned in four 90-degree increments to accommodate markings at different points on the circumference of the part.

*M E Cunningham Co, 1025 Chateau St, Pittsburgh 33, Pa*

MORE DATA? Circle 70, inside back cover

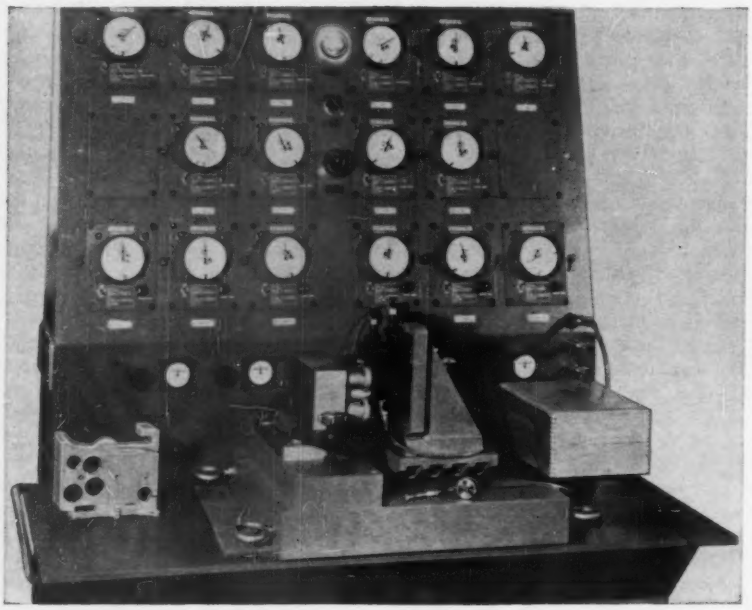



## Indicating Snap Gages Have Interchangeable Anvils

To determine whether work is within limits with this new gage, tolerance hands are set, the moveable anvil is retracted by means of a lever in the back of the gage and then allowed to snap. The amount of material left to be removed from the work is then plainly indicated on the gage. Three gaging heads are available, offering a choice of direct readings in 20 millionths, 50 millionths, and 5 ten-thousandths of an inch. With interchangeable anvils the gage can measure pitch, root, and outside diameters, recesses, grooves, splines, and pin measurements for gears. Setting is done by turning the knurled ring which operates a worm on the spindle side.

*Mahr Gage Co, 274 Lafayette St, New York 12, NY*

MORE DATA? Circle 88, inside back cover



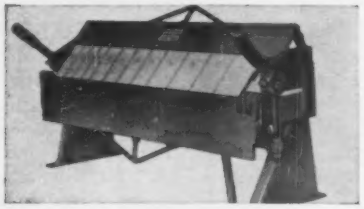
## Federal Air Gage System Checks 13 Hole Locations Simultaneously to 0.0002 in.

This airgage checks 13 hole locations simultaneously in gear trains and allows as many as 250 parts to be checked per hour. To gage holes, an operator removes a master from the fixture and inserts the workpiece. Tolerances of dimensions range down to 0.0002 in. When all dimensions are good, a green light in the top of the panel glows so that individual readings or decisions on the specific part are eliminated. If any dimension is out of tolerance, one of two lights on the meter for that dimension glows red for under and amber for over. For closer checks the exact size of each dimension is also shown on the meter. The air system is arranged so that piece-to-piece variations in bore diameters have no effect on hole location readings.

Also furnished with the unit are a meter and signal light for making direct checks of hole diameters and two spare meters.

*Federal Products Corp, Providence 1, RI*

MORE DATA? Circle 71, inside back cover



### Connecticut Bench Brakes Offered in 2 New Models

Designed for light production, two new bench brakes have the capacity to bend a ⅜-in. flange in 18-gage mild steel up to a length of 24¼ in. An adjustment is provided to set the machine for thickness of material. The standard model 218 weighs 125 lbs and can easily be moved from job to job. Model U218 is the same as the standard model except that it has 2, 3, and 4-in. fingers and will bend boxes up to 3 in. deep. It weighs only 150 lbs.

*W Whitney Stueck, Inc, Old Saybrook, Conn*

MORE DATA? Circle 72, inside back cover

### Buckeye Angle Tools Redesigned For More Compact Shape

The company has re-designed its 21A and 31A series of 90 degree angle to head drills for a more compact shape. The ¼ in. capacity air-powered tools now feature a 5/16 in. offset allowing an operator to drill within that distance of a corner, and a 59/64 in. head height for extremely low clearance work. Other new features are an enlarged bevel gear and an external grease fitting for lubricating gears and bearings, and a positive spindle lock that assures fast drill changes with only one wrench.

Tool speeds cover the 450 to 5000 rpm range, externally regulated by a choice of lock button or lever throttle. Output spindles of ¼ in.-28 and 9/32 in.- 40 may be quickly interchanged using the same 1/16 in. to No. 10 collets and chuck as on previous models.

*Buckeye Tools Corp, 5003 Springboro Pike, Dayton 1, Ohio*

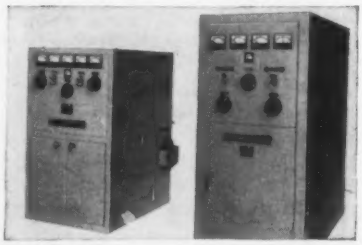
MORE DATA? Circle 73, inside back cover

### Vibratory Washer Operates At 1000 to 12,000 lb per hr

Equipment is designed for automatic in-line washing of small parts on a continuous production basis. Subsonic vibratory spiral principle, long in use on Manpro Vibro degreasers, permits maximum parts travel in a minimum of floor space. Parts are washed, rinsed, and dried in one continuous operation. Standard unit occupies only 6 x 10 sq ft of space.

*Manpro Corp, 26000 Capitol Ave, Detroit 39, Mich*

MORE DATA? Circle 74, inside back cover



### New Induction Melting Units Shave Space Requirements

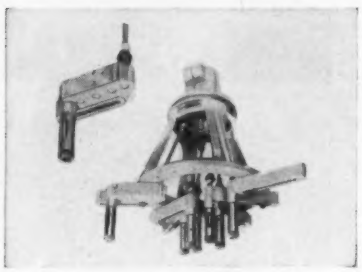
High-frequency units, the 30-kw console unit and the 100-kw melting control station, occupy considerably less space than required by previous models of the same type. The control station (left), for instance, takes up only 9.4 sq ft of floor space as opposed to the former station (right) which requires 16 sq ft.

Compact, self-contained 30-kw unit includes motor generator; capacitors; capacitor switching; main line contactor; furnace controls and motor generator controls. It can be furnished mounted on four caster-type hard rubber wheels or on a conventional platform. The 100-kw melting control station is an integral

but separate unit which allows the motor generator unit to be located on a common base with the control unit. The motor generator can be stationed either on the left or to the rear of the control. Equipped with newly designed capacitor contactors mounted to the bus, the station needs only 50% of the cables previously required. Motor starter for the 100-kw, 3000-c motor generator set is also included in this unit.

*Ajax Magnethermic Corp, Youngstown, Ohio*

MORE DATA? Circle 75, inside back cover



## Spindle Bracket Assembly Gives 4⅛-in. Extension to Drillhead

Extension brackets that increase a 10 in. drilling circle to an 18¼ in. circle have full ball bearing construction and are completely enclosed with sealed-in lubrication. The bracket assembly which gives a 4⅛ in. extension beyond the standard range of universal type drillheads also permits drilling under as well as beyond the head flange of the drillhead. The bracket also permits the use of up to ½-in. drills in steel.

*Thriftmaster Corp, 1048 North Plum St, Lancaster, Pa*

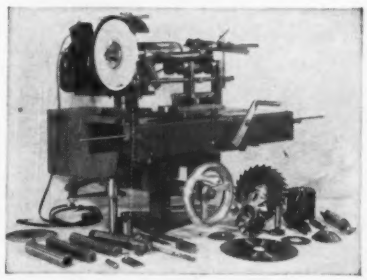
MORE DATA? Circle 76, inside back cover

## Low-Cost Patterner-Edger Added to Huron Line

Addition to the low-cost roller level and cut-to-length line allow steel or aluminum sheet to be pattern and edge rolled in any desired manner. The equipment consists of 2 or 4 hardened steel rolls with a capacity of 0.20 mild steel or 0.040 half hard aluminum. Maximum width is either 48 or 60 inches, depending on the model. Travel rate is 40 ft per minute. The machine, which operates on 220/440 volts 3 phase, requires floorspace of only 6 by 10 ft. in addition to the 10 by 40 needed by the company's level and cut-to-length line.

*Huron Inc, 8384 Vine St, Cincinnati 16, Ohio*

MORE DATA? Circle 77, inside back cover



## Centerless Cutter Grinder Sharpens Two-Lip End Mills

The Ace grinds two-lip end mills, shell end mills, side mills, thin saws, formed cutters, Woodruff keyway cutters, gear cutters, RH and LH end mills with straight or taper shanks, straight or spiral cut, and angular cutters, as well as the end faces of counterbores square or angular.

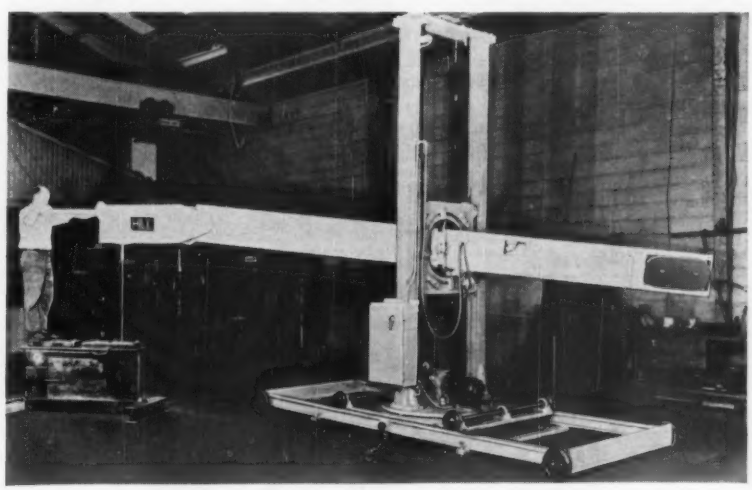
End mills with ¼, ⅜, ½, and ⅝-in. shanks are mounted in adapters or quills; those with ¾ to 1½-in. shanks are mounted direct. A formed cutter grinding device is included for formed cutters requiring saucer shaped wheels. It is furnished with plugs for cutters with holes ⅞, 1, and 1¼ in. diameter. Grinding wheel with motor may be raised, lowered, inclined to right or left, or rotated and locked on a spherical seat as conditions require. Motor is 110-120 v 60 c ac. Price is $750 fob.

*Boyer Engrg & Machine Co, Mechanicsburg, Pa*

MORE DATA? Circle 78, inside back cover

B-4 PORTABLE DRILLPRESS, added to Portomag line, is equipped with automatic power feed—*Lupear Products Inc, 4440 Haggerty Rd, Walled Lake, Mich*

MORE DATA? Circle 79, inside back cover

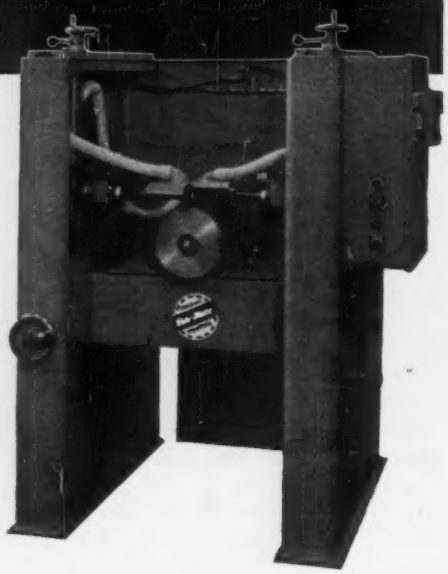


PORTABLE BRIDGE REAMING AND DRILLING MACHINE reams holes up to 1 5/16 in. diameter in structural steel assemblies. It utilizes a gimbel mounted counterweighted boom that can be raised and lowered on vertical rails attached to a swiveled roller carriage. The 14½-ft-long machine uses a No. 4 Morse taper spindle powered by either a 3 or 5 hp motor and having 4 speed selections. A crane is located on top of the machine to facilitate moving the unit to different locations in shop assembly bays—*Walter P Hill, Inc, 22183 Telegraph Rd, Detroit 19, Mich*

MORE DATA? Circle 80, inside back cover

# DEBURRING..

## No More Hand Filing, Brush or Wheel Removal of Burrs..



ROTO-MATIC Deburring Machines provide the fastest method of removing burrs from SPUR, HELICAL, WORM, HYPOID, BEVEL, SPIRAL BEVEL, SHAFT Gears, SPROCKETS and many irregular surfaces such as cams. Deburring is done at an average peripheral speed of 3 ft. per minute. By mounting the work pieces on a horizontal spindle in a vertical position and employing two floating grinding wheel units, gears are deburred on two sides after one revolution of the work carrying spindle.

Work rotation spindle is mounted on a tilt table so that bevel type gears can be angled anywhere within a range of 90 degrees. Protractors are provided to accurately indicate tilt of table, as well as locate grinding wheel spindles. Vertical position of grinding wheel spindles is adjustable to gear diameters.

With the adjustments provided set up time is reduced to a minimum. After the initial set up has been made the positioning can be charted for future use in the event of a rerun on the same part, further reducing operating time, and making short runs profitable.

If deburring is your problem, we believe we have the solution. Unit illustrated is only one of several models adaptable to a wide range of sizes.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 18, WISCONSIN

CIRCLE 301 READER SERVICE CARD

GRANT

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

*Write for literature and don't forget to send samples.*

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn. U. S. A.


## NAMES IN THE NEWS

the Industrial Products Division. He was previously factory manager of the Ithaca plant of Morse Chain Division of Borg-Warner Corp.

**Cincinnati Milling Machine Co** has appointed **C Bruce Minturn** (top) manager of the enlarged Meta-Dynamics Division. He was formerly manager of the Electrical Machining Department, now a part of Meta-Dynamics. **Howard W Carlisle** (bottom) will be manager of metal forming at the division

**Gleason Works,** Rochester, NY, has named **John Somerset** a director of Gleason Works Ltd, English subsidiary. He is vice president, sales of the parent firm

**Eutectic Welding Alloys Corp,** New York, has named **Guy A dal Molin** manager of engineering.

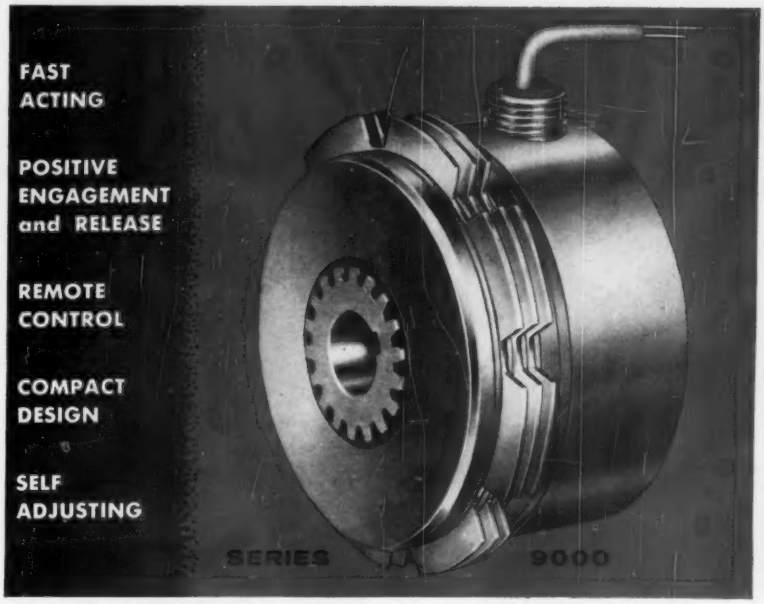
**Brown & Sharpe Mfg Co's** Machine Tool Division has named **John F Hines** director of milling machine sales. He was formerly sales manager of the Cutting Tool Division

**Anocut Engineering Co,** Chicago, has appointed **Arthur Heine** manager of mechanical manufacturing. He was previously associated with Danly Machine Specialties

**Norton International** has named **Dr Wilfred F L Place** vice president in charge of European operations. He has been general manager of NI since 1957 with headquarters in Worcester, Mass, and will now be located in Paris

**Wheel Trueing Tool Co,** Detroit, has elected **Patrick Adamson** a vice president. He has been active in the company's diamond drill bit manufacturing operations for the past 20 years.


# IDEAL FOR AUTOMATED MACHINES




**Maxitorq**

ELECTRIC

CLUTCHES and BRAKES

Incorporating advanced design principles proved through years of service, the MAXITORQ Electric Clutch is well adapted to all types of machine drives. Simple in design . . . built to machine tool standards . . . requires no adjustments, can be used either as a clutch or brake. Disc separators not only separate discs, but also break up residual magnetism and result in extremely fast, positive action with no drag or heating in neutral. There are few moving parts. Electrical operating unit remains stationary — hence, no troublesome slip rings, brushes, or difficult wiring problems. Operation is on standard 100 V d.c. Other voltages on special order.

If you have a clutch or brake application where you are looking for NEW and IMPROVED performance, we invite you to bring the problem to us. Phone, wire, or write Dept. AM for Bulletin No. 90.

**SPECIAL FEATURES**

**Engaged entirely by magnetic flux.**

**Operate either on-off or by varying voltage for torque control.**

**NO troublesome slip rings or brushes.**

**NO levers, cams, or other highly stressed mechanical parts.**

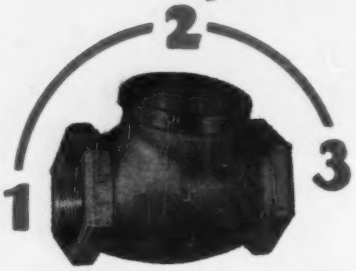
**Operation is not dependent upon rotation.**

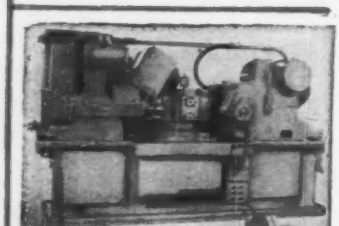
**Finished complete, assembled, and ready to install on shaft.**

ICJ61

**THE CARLYLE JOHNSON MACHINE CO.**
MANCHESTER, CONN.

Single set-up covering
ALL finishing operations...
MEANS
GREATER ACCURACY
with
GOSS DeLEEUW





AUTOMATIC
CHUCKING
MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

*Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.*

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

**GOSS and DE LEEUW**
**MACHINE COMPANY, KENSINGTON, CONN., U.S.A.**

## NAMES IN THE NEWS

**E W Bliss Co** has named **W Ben Flanigan** manager of sales and marketing. He was formerly vice president of Gamewell Co, a Bliss subsidiary

**Warner Electric Brake & Clutch Co,** Beloit, Wis, has elected **Edward A Cleary Jr** executive vice president. He has been serving as vice president, operations

**Pratt & Whitney Co,** West Hartford, Conn, has appointed **Edward E Kirkham** manager, Systems Engineering Section. **Herman W Meyer** has been named manager, Plans and Technical Section, and **Mark H Sluis** is new manager of the Electrical Design Section.

**Grinding Wheel Institute** has elected **William G Pinkstone** of **A P de Sanno & Son** president to serve during 1962. **Carl F Leitten, Electro Refractories & Abrasives Corp,** has been elected vice president; and **Leon A Patt, Carborundum Co,** chairman of the board.

### OBITUARY

**William Austin Darrah,** 74, vice president of **Lindberg Engineering Co,** Chicago, died recently after a long illness. Mr Darrah was the founder of Continental Industrial Engineers Inc which merged with Lindberg to form one of the world's largest manufacturers of industrial heat treating and process line equipment.

## Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

### MACHINES AND ATTACHMENTS

**1** DIAGONAL GEAR SHAVER—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* Bulletin CS60-1 illustrates and describes Red Wing Model GCU. Accompanying bulletin S60-1 discusses advantage of camshaft gear shaving, shows in graph form just what shaving accomplishes.

**2** ROTARY TABLES — *Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.* 8-page catalog A-25 covers rotary tables — including numerically controlled, air-lift, power, hand crank, and manually indexed models. Operating characteristics, specifications, and important design features and advantages are included for each model. Universal tilting rotary tables and sliding platen tables are also pictured and described.

### TOOLS AND ACCESSORIES

**3** COLLETS AND PUSHERS—*National Acme Co, 170 E 131 St, Cleveland 8, Ohio.* 12-page bulletin CP-61 describes line. Covers solid collets and pushers; master collets and pushers; spool bushings and guide bushings for all Acme-Gridley Bar Automatics.

**4** TOOLHOLDERS — *Vascoloy-Ramet Corp, 800 Market St, Waukegan, Ill.* 4-page illustrated bulletin 6106 gives details on cartridge-type toolholders for carbide throw-away inserts. Features of the V-R Insert-Cartridge System, detailed drawings and specifications for each of five standard, basic cartridges are included. This tooling concept, available in 18 variations for RH or LH and rake angle options, makes it possible to assemble an unlimited variety of single or combination boring, facing, and recessing tools with only five basic cartridges.

**5** MILLS AND CUTTERS—*Niagara Cutter, 330 Niagara St, N Tonawanda, NY.* 20-page illustrated catalog 961 gives specifications on complete line of standard side mills, face mills, single and double angle cutters, and toolbits available from stock in new in-between-sizes. Also pictures and describes wide variety of special cutters.

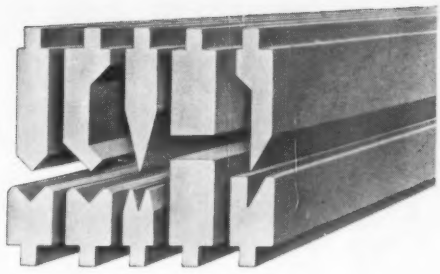
**6** THERMOCOUPLES—*Barber-Colman Co, Wheelco Industrial Instruments Division, Rockford, Ill.* 56-page catalog TC13A provides data on comprehensive line of thermocouples. Includes descriptive and engineering information concerning usage and application.

● TOOL SELECTION FOR BORING — *Wesson Corp. 1220 Woodward Heights Blvd, Ferndale 20, Mich.* 8-page bulletin 9-61 is an evaluation of all factors relating to the choice between throw-away or regrindable carbide tools. Discusses 14 major factors, all of which have a bearing on tool material selection and which can and do affect the selection. Request direct on company letterhead.

**7** ELECTRONIC GAGE BLOCK COMPARATOR—*Federal Products Corp, Providence 1, RI.* 4-page illustrated brochure describes Model 130 B-12 graduated in 0.000001 in. Special features which eliminate gaging friction are described and pictured as well as other factors which contribute to the high sensitivity and accuracy of the instrument.

**8** MILLING CUTTERS FOR ALUMINUM—*Goddard & Goddard Co, PO Box 68, Brightmoor Station, Detroit 23, Mich.* 27-page bulletin 122 discusses and illustrates a complete line of end mills, solid HSS cutters, inserted cutters, shell


press brake tooling



**Standard Type PRESS BRAKE DIES**

62 different sizes and styles • Most in stock for off-the-shelf delivery

CHICAGO standard type press brake dies are used for a large variety of bending operations in any make or size of standard press brake. They are economical, and the quick delivery saves time in tooling up. Available in any length from 4 to 12 feet in increments of 2 feet; *induction hardened* or Diekrome steel.

The local distributors listed below offer immediate delivery on many sizes and styles of standard type CHICAGO press brake dies. If you have Bulletin STD-959 you can order any standard type die by number. Why not ask your nearest distributor for a copy? Also, if your requirements call for special multibend and forming dies, he can tell you about Dreis & Krump complete tooling service for any make of press brake.

*Call your nearest distributor*

**ALABAMA**
**Birmingham**
Hinkle Supply Co., Inc.
FAirfax 2-4541

**CALIFORNIA**
**Los Angeles**
Meyer Sheet Metal Mchry. Co.
MAdison 2-1477
**San Francisco**
Tay-Holbrook, Inc
MArket 1-6800

**GEORGIA**
**Atlanta**
Allison Mchry. Co.
Phone: 875-9488

**INDIANA**
**Indianapolis**
E. L. Hunston Co., Inc.
WAlnut 5-9691

**IOWA**
**Bonaparte**
Corry's Machine & Tool—Phone: 112

**KANSAS**
**Wichita**
Elifeldt Mchry. & Supply Co.
AMherst 7-9773

**MASSACHUSETTS**
**Cambridge**
Austin-Hastings Co., Inc.
Kirkland 7-4480

**MICHIGAN**
**Detroit**
J. Lee Hackett Co.—TRinity 2-6442
**Grand Rapids**
Wing and Jabaay—CHerry 1-2125

**MINNESOTA**
**Duluth**
Girard Steel Supply Co.
MArket 8-1001
**Minneapolis**
Minnesota Steel & Mchry. Co.
FEderal 3-6273
**St. Paul**
Girard Steel Supply Co.
MIdway 6-8635

**MISSOURI**
**Kansas City**
Elifeldt Mchry. & Supply Co.
VIctor 2-5494

**NEW YORK**
**Buffalo** (Depew)
J. W. Hoffman Mchry. Co.
NT 4-1833
**New York**
Federal Machinery Corp.
CAnal 6-3022
H. Weiss & Co.
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FAirfax 3-1313

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**American Machinist** / *Metalworking Manufacturing*

A McGraw-Hill Publication, 330 West 42nd Street, New York 36, N.Y.

Three out of five metalworking machines in the country today are over-age. The U.S. has dropped to fourth place (after Russia, West Germany and Red China) as a producer of machine tools.

What are we doing about it?

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*For up-to-date facts and figures on metalworking, ask your* AM/MM *district manager for a copy of the Market Guide for Sales Executives.*

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## Free Literature

**To order any of these bulletins, circle corresponding number inside back cover.**

mill arbors, adapters, and a 6-page section devoted to special types of cutters for aluminum. Includes pointers for good milling and explains in detail recommended speeds and feeds for milling aluminum and similar metals.

**9** TOOLS—*Weldon Tool Co, 3000 Woodhill Rd, Cleveland 4, Ohio.* 20-page supplement to catalog 11 covers additions to line. In addition to new end mill developments and other cutting tools described, many new heavy-duty toolholders and grinding and measuring fixtures are offered.

**10** SPADE DRILLS AND DRIVERS —*Microbore Division DeVlieg Machine Co, Fair St, Royal Oak, Mich.* 4-page folder MSD-123 gives data on standard spade drills and spade drill drivers of the Y type for one-pass drilling of metal out of the solid. Covers complete range of sizes made; includes sketched details of drivers for spade and core drills and for turret lathes, also of Y-type head and stem assemblies with oil holes, Morse taper drivers without oil holes, and HSS spade drills. Tables cover range of diameters, mounting and shank dimensions, cutter specifications.

**11** THERMOCOUPLE SELECTOR BOARD—*Smith Thermotronics Inc, Conshohocken, Pa.* 11 x 14-in. board, designed for wall mounting, and designated TSB-1, aids in selection. The Big Four thermocouples shown will satisfy over 90% of the standard applications. All of these instruments are made of Permakouple material by the SPS (single pass swaging) process. They are calibrated to be twice as accurate as standard ISA specifications.

### HEAT TREATING AND WELDING

**12** ALLOYS AND FLUXES—*All-State Welding Alloys Co, White Plains, NY.* 4½-page folder provides a handy reference to specialty products for welding, soldering, and brazing. Fluxes are featured in a special section and a new No. 430 stainless solder kit is described. Alloy selection charts are included together with electrodes for cast iron welding; a range of copper and bronze alloys for welding and brazing; Spoolarc alloys for aluminum welding; and a product grouping for solders and silver alloys.

**13** TIG WELDING—*General Electric Co, Schenectady 5, NY.* 2-page bulletin GEA-7568 describes how TIG welding is used during service shop rebuilding process to make solid copper joint between armature coil lead and commutator riser, eliminating solder throwing. Shows comparative photomicrographs of a soldered joint and a solid copper TIG welded joint. Graph illustrates relative strengths.

**14** AUTOMATIC WELDING PROCESS CHART—*Hobart Brothers Co, Troy, Ohio.* 17 x 22-in. wall chart is designed to aid in the selection of the proper automatic or semi-automatic welding process for a particular application. Submerged arc, inert-gas-metal-arc, $CO_2$ gas-metal-arc and tubular wire welding are covered. Major advantages and limitations of each process are listed.

### PLANT SERVICE EQUIPMENT

**15** COMPRESSED AIR — *Wilkerson Corp, 1671 W Mansfield, Englewood, Colo.* Enlarged from 24 to 54 pages, this pneumatic engineering manual contains information on the use of air power, correct air system installations, and 23 charts and graphs illustrating the properties of air under varying conditions.

**16** SAFETY EQUIPMENT — *Speakman Co, 30th & Spruce Sts, Wilmington, Del.* 28-page catalog AIA File 29H-3 describes latest types of emergency deluge showers, aerated eye and face wash fixtures, and water spray accessories for use where fire, acids, dust, and similar hazards exist. Contains special sections on safety zone decontamination stations and laboratory safety stations, with photos and drawings showing installation details and piping requirements. Included are instructions for developing a safety test program.

**17** DEHUMIDIFIER — *Remington Air Conditioning, Div of Remington Corp, Auburn, NY.* 6-page bulletin 5285 gives data on 22 industrial and commercial dehumidifier applications together with a simplified method for approximating the dehumidifier capacity required for practically any kind of application. Also includes specifications, operating range, and ratings for the Model D20 automatic electric unit which employs a 2-hp hermetic refrigeration cycle.

**18** SAFETY PRODUCTS — *American Optical Co, Safety Products Division, Southbridge, Mass.* 8-page brochure S-1953 illustrates and describes equipment for protection when welding, cutting, and burning. Covers welding helmets, goggles, and face shields. 8-page brochure S-1465 covers the Dura-Guard safety hat and cap and accessories. 11-page brochure S-1869 gives information on complete line of safety glasses available in four basic models.

### PARTS AND MATERIALS

**21** TOOLING PLATE—*Aluminum Co of America, 1250-K Alcoa Bldg, Pittsburgh 19, Pa.* Brochure, "Alcoa Aluminum for Tooling Plates," outlines ways in which the use of Alcoa tooling plates can help reduce operating costs in the fabrication, handling, use, and storage of tool fixtures and jigs. Specification data for selecting the proper tooling plates appears on two center pages which can be used as a wall chart; they include tolerances and properties for Alcoa cast and wrought products.

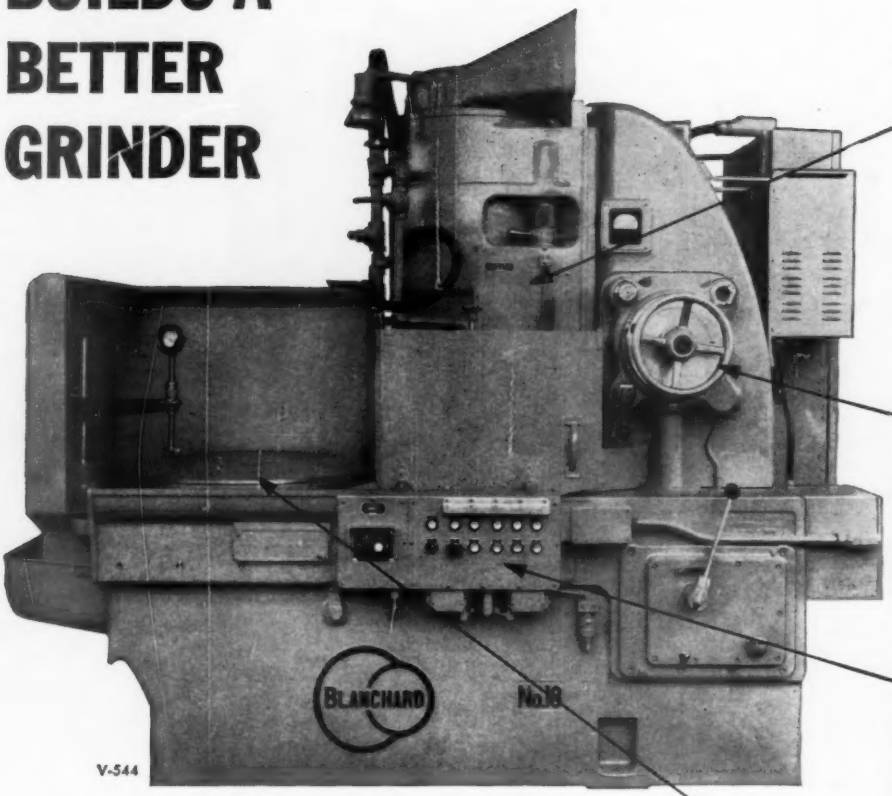
**22** ROTARY SOLENOIDS—*Ledex Inc, 123 Webster St, Dayton 2, Ohio.* 32-page catalog C-961 contains complete technical data on eight basic sizes. Tells how to use solenoid data in actuating applications and lists complete details on 222 models carried in stock. Sizes range from 1 in. diameter by ⅝ in. in height and 3¼ in. dia by 2 5/16-in. heights. Standard strokes are available from 25 to 95°, RH and LH. Torque outputs range from 0.15 to 98 lb-in., depending on size degree of stroke, and duty cycle.

**23** COLUMBIUM ALLOY — *Westinghouse Electric Corp, Materials Manufacturing Dept, PO Box 128, Blairsville, Pa.* Data sheet 52-264 describes B-33 used for high-temperature applications. Physical and mechanical properties are discussed together with information on recrystallization, oxidation, corrosion, and fabrication. Graphs of the product's tensile properties and stress rupture properties included.

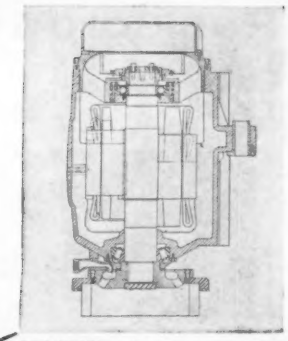
**24** TUBING—*Peterson Steels Inc, Union, NJ.* 42-page technical and metallurgical data book, "52100 Alloy Steel Mechanical Tubing," describes with charts, diagrams, and photos, the applications, basic characteristics, and recommended procedures for the material. Contains a section on how alloy steel tubing is made; how to properly select tubing, and tables of temperature and hardness conversion.

**25** STAINLESS BARS AND FORGING BILLETS—*Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh, Pa.* 80-page booklet with new data gives detailed information on corrosion resistance, fabrication, machining, welding, thermal treatments, mechanical properties of stainless steel bars. Charts, graphs, and photos included.

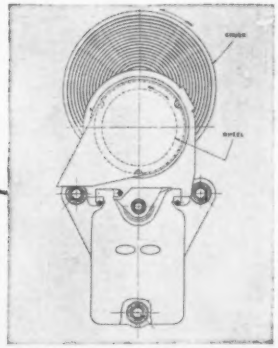
# HOW BLANCHARD BUILDS A BETTER GRINDER



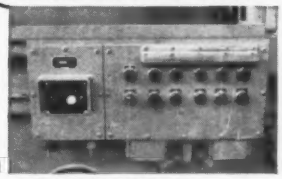

V-544



**SPINDLE** . . . incorporates a superior, pre-loaded anti-friction bearing system that removes all backlash and radial play. Integral "balanced" mounting of rotor on spindle eliminates vibration.

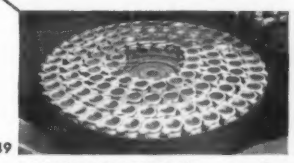


**WHEEL HEAD COLUMN** . . . is of heavy box-section design for extra rigidity . . . supported at 3 widely-spaced points. Column may be easily adjusted for alignment. Special column tilting devices available to produce concave or convex surfaces.



V-541

**GRINDER CONTROL** . . . is compact and conveniently located for fatigue-free handling. All control panels are BLANCHARD manufactured for troublefree operation.



W-949

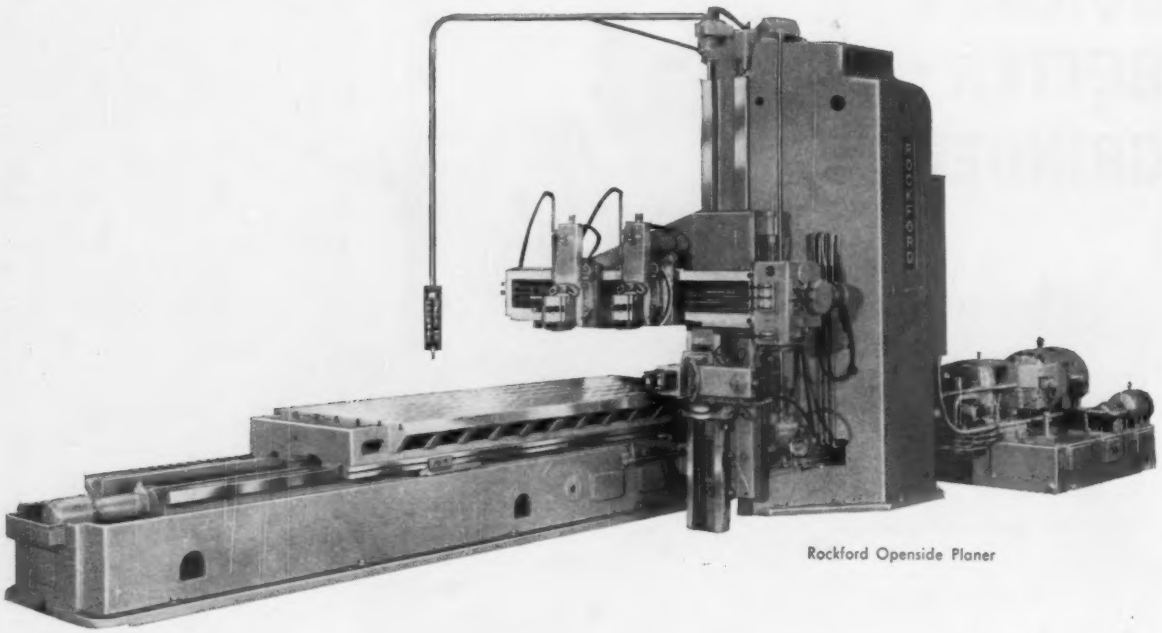
**MAGNETIC CHUCK** . . . provides maximum useful magnetic surface . . . has such closely spaced poles, that work as small as a quarter will always touch two or more.

There's no mystery about the *better* performance you get with a BLANCHARD Surface Grinder. It's simply a matter of *better* design of each individual machine part. For example, look at just 4 features of the No. 18, shown at the right.

Get complete details on all 24 models of BLANCHARD grinders. They're today's leading high precision, high production grinders on materials ranging from carbon to quartz . . . from bronze to steel. You can handle parts ranging from tiny jewels to giant plates up to 108″ across corners.

***PUT IT ON THE*** BLANCHARD **THE BLANCHARD MACHINE COMPANY**
64 State Street, Cambridge 39, Massachusetts

# Rockford Hy-Draulic Machines mean more profits!



Rockford Openside Planer

## OUR USERS SAY:

**Press Brake Die Manufacturer:**

"We are machining the tongues of steel press brake dies on a Rockford Hy-Draulic Planer at the rate of *2 dies every 15 minutes.* Other methods take up to 7 hours per die."

**Ship Builder:**

"Our Rockford Hy-Draulic Shaper-Planer paid for itself during the *first 18 months of operation.*"

**Milling Machine Manufacturer:**

"We have a good maintenance-cost record on all our machine tools. Our Rockford Shaper-Planers show less than *8 hours maintenance per year.*"

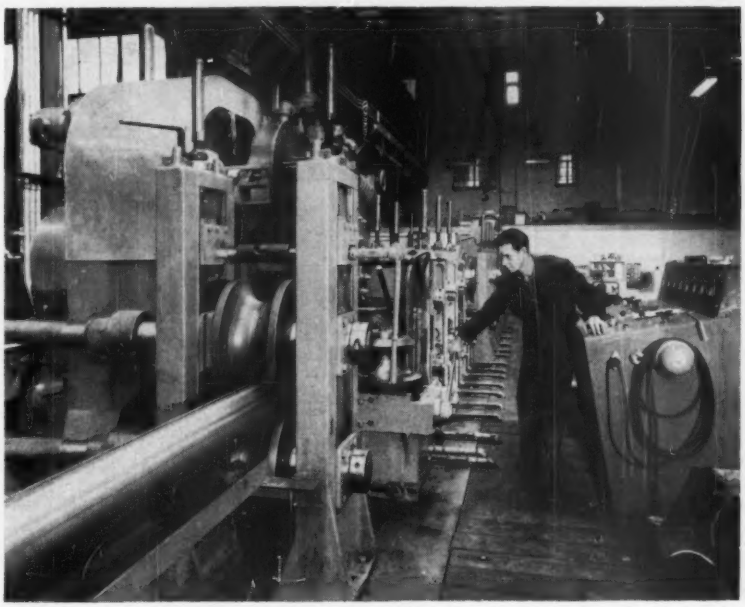
**Let us show you how you can reduce operating costs and increase profits. Ask us for a comparison-study on your present equipment. No cost or obligation.**

**ROCKFORD MACHINE TOOL CO. ROCKFORD, ILLINOIS**

## $1.3 Million in New Equipment Installed by Welded Tube

Equipment, including a 260-ft-long tube mill for manufacture of electric welded carbon-alloy steel tubing, has been put into operation at Welded Tube Co of America's two Philadelphia plants. Company reports that by year's end it will be the only firm in the country using a continuous electric weld process to make sizes up to 11 in. round, 8 in. square, and 12 x 4 in. rectangular.

The tube mill, made by Yoder Manufacturing Co, Cleveland, is composed of nine forming stands, each with a pair of rolls that differs with the preceding pair in contour. After the steel sheet is rolled into a full round it passes under a pair of large copper wheels (electrodes) which bring the edges to a plastic state. It then passes through a set of squeeze rolls which apply pressure to create a fusion of the metal. No additives, such as welding rods, are used in this process. After welding, the tube passes through a cooling trough then goes into the sizing section of the mill where additional stands and rolls apply pressures to bring it within tolerances required. It can then be finished in a round, square, rectangle, or any one of the many shapes. From the finishing stands the tubing feeds itself into a traveling saw cutoff that automatically cuts it to a predetermined length.



**Welding and forming section of Yoder 11-in.-dia tube mill,** installed at Welded Tube Co plant, processes 7⅝-in. round tube which will be cold formed into 6 in. square and 8 x 4 rectangle. Control pulpit is on right

## Stanley Acquires British Firm

S N Bridges & Co Ltd, one of the largest manufacturers in England of electric and pneumatic power tools, has been purchased by Stanley Works of New Britain, Conn, a leading manufacturer of builders hardware and hand tools in the US. The entire capital stock of Bridges has been acquired by Stanley Works, Great Britain Ltd, Sheffield, England, a wholly owned subsidiary.

## Douglas Expansion Plans to Total $50 Million Over Next 10 Years

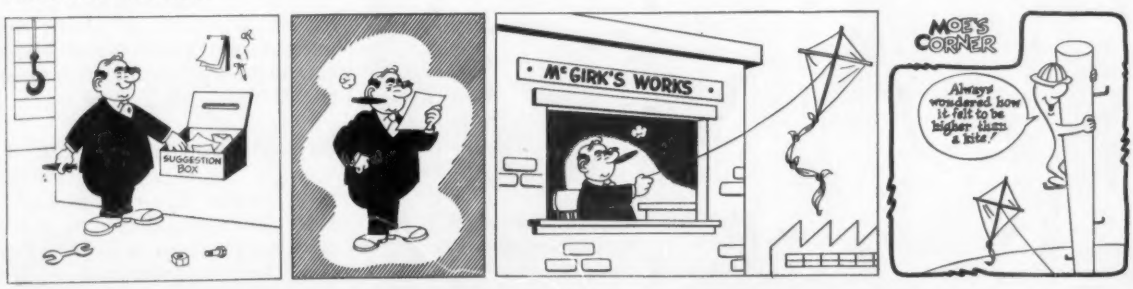
The Missile and Space Systems Division of Douglas Aircraft Co is studying plans for plant and research facilities expansion which may reach $50 million by 1971. Work is already underway to establish the long-range facility development plan for the next decade.

Scope of the work will take into consideration requirements for engineering, administrative, test and laboratory, basic research, and manufacturing facility needs. Plan calls for the building of a $3 million space chamber in the near future. And, Charles R Able, vice president, general manager of the division, estimates that the manpower of the division will grow from the present 17,000 persons to 25,000 by 1971. Of these, some 50% will be engineers or technical personnel.

## J&L, Besly Welles Combine Threading Tool Lines

Besly-Welles Corp, South Beloit, Ill, and Jones & Lamson Machine Co, Springfield, Vt, will market the threading tool products of both companies through Besly-Welles. Sales of J&L machine tools and optical comparators, and Besly-Welles grinders and abrasives will not be affected by this move.

McGIRK'S WORKS



## Easy Operation, Precision Measurements ...with Wilson "Rockwell" Hardness Testers

No matter what your hardness testing requirements are, there's a Wilson Rockwell instrument to do the job easily and accurately. Wilson instruments on the production line and in the laboratory offer these advantages:

**Accuracy**—Precision-built, with exact calibration, for consistently correct results.

**Easy operation**—Even an unskilled operator can get perfect readings. All controls conveniently grouped.

**Long life**—Simple design, rugged construction make Wilson instruments as durable as a machine tool.

**Easy maintenance**—Interchangeable mechanisms, with spindles mounted in oil-less bearings.

**Complete line**—Choose from the widest variety of instruments available, including semi and fully automatic models and Wilson "Brale" diamond penetrators.

**Write for details**—Ask for Catalog RT-58. It gives complete information on the full line of Wilson Rockwell hardness testers and accessories.

# WILSON "ROCKWELL" HARDNESS TESTERS

ACCO

**Wilson Mechanical Instrument Division**
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## ANTON MAGNETIC ADJUSTABLE V-BLOCK

Unsurpassed for layout, toolroom and production. Can be used on any machine equipped with magnetic chucks.

SAVE MONEY, TIME AND LABOR

- Vernier accuracy: ±15 seconds
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- Size: 6" long, 4½" wide, 2½" high

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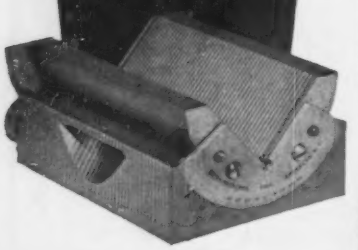

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1827 **Burke & James, Inc.** 1951
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### Twin Coach Sells Assets Of York Body Division

Assets of the York Body and Equipment Co Division, York, Pa, have been sold by Twin Coach Co, Buffalo, to Pitman Manufacturing Co, Grandview, Mo. Pitman makes hydraulic equipment for trucks used in the public utility and construction industries. York manufactured commercial and utility truck bodies and components at the time of the sale.

Production of electronic equipment shelter units was transferred from the York facility to Twin Coach's Aircraft-Missiles Division in October. This product line will be retained and expanded by Twin Coach.

### Firestone to Build in SC

Largest single industrial unit to move into Spartanburg, SC, in modern history will be a 200,000 sq-ft metal fabricating plant, estimated to cost between $7 and $10 million, that'll be erected by Firestone Tire & Rubber Co. The new facility, which will go up on a 65-acre plot, will be operated by the Firestone Metal Products Division. It'll fabricate beer kegs, soft drink and milk vending machine mix storage tanks, and chrome-plated automobile trim. Firm is expected to hire about 250 workers by next summer.

### Chicago Molded Acquires Site, Plans Expansion

Chicago Molded Products Corp, 42-year-old plastics firm, has acquired 40 acres of land in Michigan City, Ind, and a 150,000 sq-ft industrial building with a 20,000 sq-ft office building adjoining. Purchase provides the base for establishment of a major plant facility which will represent an investment of about $1 million.

New property will headquarter the Campco Plastics Co Division. Among the principal operations for which the plant will be set up will be extrusion of various types of rigid plastic sheet and film, processing and fabrication of plastic sheet into industrial products and components, and plastic containers for packaging.

### OK Tool Forms English Firm

The OK Tool Co, Milford, NH, and Firth Brown Ltd, Sheffield, England, have established a joint company to be known as Speedicut-OK Tools Ltd, headquartered in Shef-


CIRCLE 313 READER SERVICE CARD CIRCLE 314 READER SERVICE CARD

field. The complete line of OK cutting tools, including custom engineered multiple operation tools, will be manufactured by Firth Brown which employs 2200 and is a subsidiary of the John Brown Co, engineer and shipbuilder. Speedicut-OK Ltd will become sole selling agents in the UK.

### American Steel Foundries Plans . . .

. . . to change its corporate name to Amsted Industries Inc, subject to stockholder approval in January. In order to preserve the commercial value of its old name, the Transportation Equipment Division and the Hammond Division will be operated as American Steel Foundries Inc.

Diversification, as usual, is the reason for the name change. Acquisitions and new product development during the past 11 years have taken the company into production of roller chains and sprockets, small precision machine tools, cast iron pressure pipe for water mains, and the application of protective coatings to steel pipe for the oil and gas industries.

### Norelco X-Ray School Scheduled For New York in February

The 41st Norelco X-ray Analytical School, sponsored by Philips Electronic Instruments, will be held at the Henry Hudson Hotel, New York City, during the week of Feb 5-9. Registration for the course, which will cover X-ray diffraction, diffractometry, and spectrography, is open to metallurgists, chemists, physicists, production supervisors, quality control engineers and others interested in the application of these techniques.

There is no charge for attendance, but capacity is limited. Those who

AM/MM

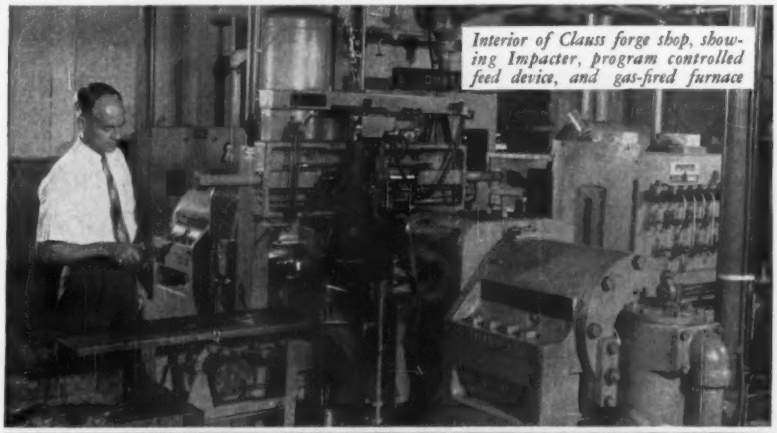
*Detail showing tong positioning hot stock between Impacter dies*

**BETTER drop forgings FASTER automatically...on the Impacter**

Clauss Cutlery Company, Fremont, Ohio, is getting **better quality, increased production, reduced scrap,** and **savings in stock** required per forging, for their famous Clauss line of scissors, shears and snips. The Cecomatic Forging Process, incorporating the new **Model "C" Impacter,** is responsible for these and many other outstanding benefits. To learn how, write for a reprint of The Clauss Story and a copy of Bulletin 110-L-1.

**CHAMBERSBURG ENGINEERING COMPANY • CHAMBERSBURG, PA.**

THE FRANKLIN INSTITUTE'S 1961 LONGSTRETH MEDAL "FOR INVENTIONS OF HIGH ORDER" WAS AWARDED THE DESIGNERS OF THE IMPACTER

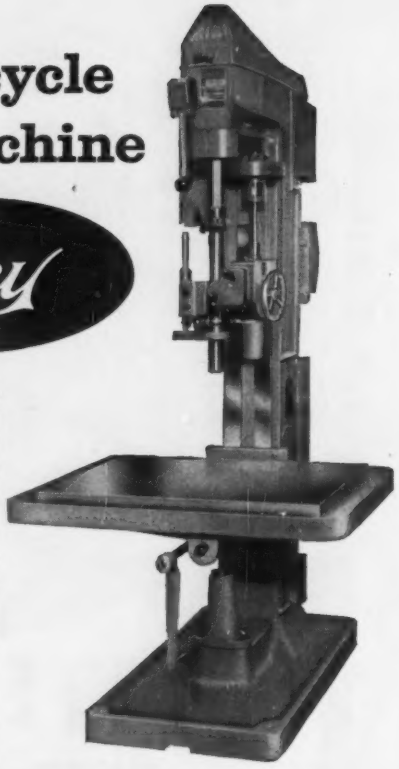


*Interior of Clauss forge shop, showing Impacter, program controlled feed device, and gas-fired furnace*

CHAMBERSBURG

# automatic cycle drilling machine

Avey



You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit. Adjustable rapid power traverse, feed, and rapid return of the spindle permit automatic transfer or rotary index fixturing. You also get adjustable feeds, speeds, table travel, head travel, and Avey's precision spindle. Morse Taper 2, 3, or 4; single or multiple spindles 1 to 5 hp. *Write or phone for data.* Avey, Box 1264, Cincinnati 1, Ohio.

CIRCLE 316 READER SERVICE CARD

*Fast, nationwide service on*

## PRESS BRAKE DIES

Standard V dies and special hydro-cammed dies for light and heavy forming built by the world's most experienced manufacturer of hydraulic press brakes.

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## PACIFIC DIES

PACIFIC PRESS & SHEAR CORP., MT. CARMEL, ILLINOIS




plan to attend should notify the company as soon as possible. Address is 750 South Fulton Ave, Mount Vernon, NY. Norelco Schools are also held in Chicago (June), and in San Francisco (September).

### Orders to Pullman Plant

The Bessemer, Ala, plant of Pullman-Standard has received orders assuring its continuous operation through the first quarter of 1962 at least. Seaboard Air Line Railroad has ordered 500 seventy-ton steel boxcars at a cost of $7.6 million. Another is from Atlantic Coast Line RR for 350 boxcars costing $4.6 million.

### Houser Builds Again in Tenn

Houser Inc of Fort Wayne, Ind, which recently completed construction of a pump and meter plant at Greeneville, Tenn, has chosen Cookeville as the site of a new plant to manufacture lubrication and filtration systems for power plants, steel mills, jet aircraft and other installations. Initial employment is expected to be approximately 400.

### Ling-Temco-Vought Rocket Order

An $8.6 million contract has been awarded by NASA to Ling-Temco-Vought of Dallas for continued production of the four-stage, solid-fueled Scout rocket, expected to become a major research tool in various NASA space projects.

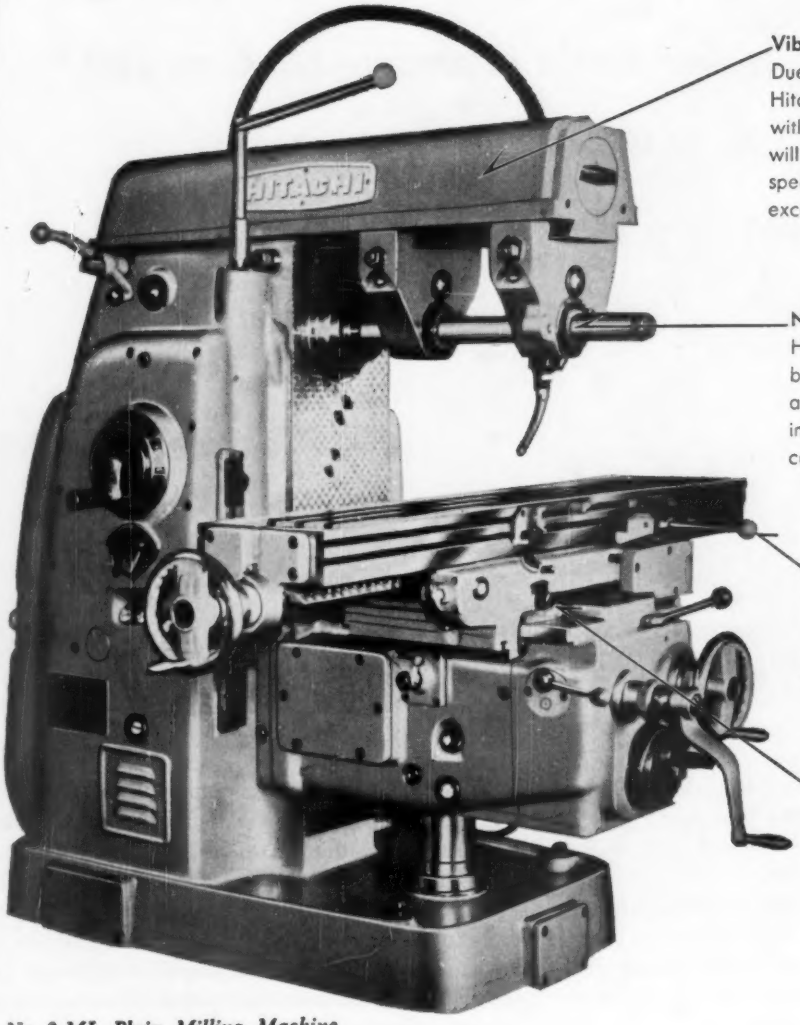
### $24.8 Million Turbine Order Goes to Lycoming

Contracts for gas turbine engines totaling almost $25 million, largest single production order of its kind ever received by the company, have been awarded to Avco Corp's Lycoming Division, Stratford, Conn. The awards were made by Air Force Systems Command.

AM/MM

*"Sir, I've been elected by the boys in the shop to speak to you."*

# HITACHI
# NO. 2 ML MILLING MACHINES




*No. 2 ML Plain Milling Machine*

**Vibration Damping Device**
Due to a vibration damping device of Hitachi's exclusive design contained within the over-arm, minimum vibration will be set up even during higher speeds and feeds operation, so that an excellent finished surface is obtained.

**New-Type Arbor Support Bearing**
Hitachi's unique super precision-type bearing, a combination of plain metal and needle bearing, is incorporated into the machine to enable high speed cutting with high precision results.

**Mono-Lever Control System**
Hitachi's unique Mono-lever Control System makes the operation simple and easy. Table-feeding too can be performed with ease.

**Backlash Eliminator of Lead Screw**
As the use of two independent nuts eliminates backlash on the table feed screw, smooth down-cutting can be effected.

## SPECIFICATIONS :

- 53 1/8"×10 1/16" Table
- 28" Longitudinal Traverse
- 16 Table Feeds 1/16" — 78 3/4"/min.
- 16 Spindle Speeds 25 — 1,500 r.p.m.
- 7.5 h.p. Main Motor

Hitachi, Ltd.
Tokyo Japan

**Cable Address : "HITACHY" TOKYO**

***"We had 18-20 hours downtime every time we changed heats. With strip, we just hook on from heat to heat. No downtime."***

***"With strip we use smaller blanks to produce the same part."***

***"By using strip we save downtime, die repairs."***

***"Rejects have dropped from about 8% to less than 1%."***

***"We found we couldn't afford the low cost of sheet."***

Read why Target Stamped Products, Inc., Kinsman, Ohio, switched from strip to sheet—and then back to strip. Comments are Harvey Haynam's, Target's president:

"We thought we'd give sheet a try back in 1958. The low cost looked too good to pass up. Today, you'd have a hard time finding a piece of cold rolled sheet around the shop.

"We were absorbing 18-20 hours of downtime every time we changed heats. With strip, we just hook on from heat to heat. The characteristics are the same from heat to heat and coil to coil. We don't waste time adjusting our dies.

"Strip saves us metal. We can use smaller blanks to produce the same part. I'd say we save from 1/16" to 3/32" of metal per part. That's a lot of steel when you're turning out 25-30 million parts a year.

"We don't have gauge problems now. The strip we buy is always rolled within our working tolerance. We work to a plus or minus .0025 inches.

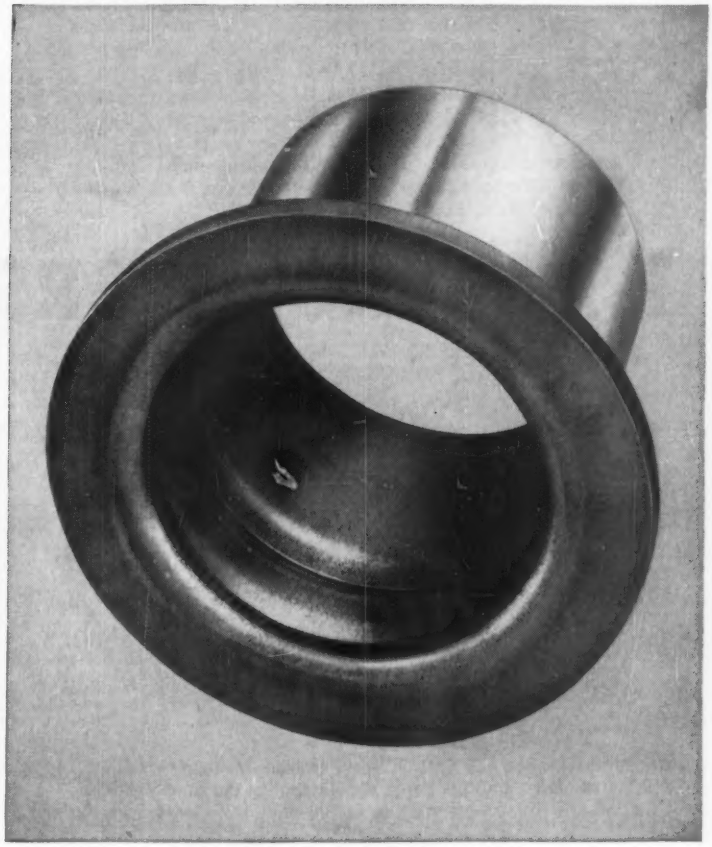
"So far, strip hasn't given us lamination troubles. It doesn't take much lamination to give you big trouble in a deep drawing operation. When the metal separates, part may stick to the punch while part stays in the cavity. As another blank transfers to the same station, there's a double smash and the die is ruined. That hasn't happened with strip. Saves a lot of downtime and die repair.

"Strip takes a deep draw without thinning out on you. Its uniform temper pays off when you're turning out Silent Blocks where both the ID and OD have to be right or the part's a reject.

"All in all our rejects have dropped from about 8% to less than 1% since we switched back to strip.

This mark tells you a product is made of modern, dependable Steel.

Outer metal bushing of a Silent Block. Target Stamped Products turns out millions of these each year for the auto industry. Silent Blocks are used in the suspension systems of all American cars—about eight to a car. To produce the piece, Target must work to a plus or minus .0025" tolerance or the Silent Block won't work. When Target switched back to strip, their rejects dropped from about 8% to less than 1%.



"You can have all the automation in the world, but if you're using the wrong steel, it just nickels and dimes you to death. With strip our machines keep working; we need less supervision, less tool repair. Our trim is small and our percentage of rejects is the smallest we've ever known. We found out we couldn't afford the low cost of sheet. That's why we're back with strip."

# *The switch is back to strip*

Cold rolled sheet steel can be your best buy on a cost per pound basis. Certainly its quality has risen sharply since the war. But, pound cost is only part of the story. If you really need steel tailored to your specific production requirements, cold rolled strip is the answer.

Strip is not sold on an as-rolled basis. What you buy is a specific chemistry, temper, dimension, edge and finish to precisely meet your fabricating and end-use requirements.

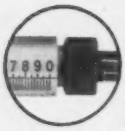
American Steel and Wire has over 12,000 mill practices in available strip specifications. Many of your processing steps may actually be eliminated by using cold rolled strip.

Take a hard look at your production line and let our salesmen look with you. Check your rejects, your downtime, your scrap rate. Perhaps you can improve the quality of your product and cut production costs at the same time, with *tailored-to-the-job* cold rolled strip from American Steel and Wire. American Steel and Wire Division, Rockefeller Building, Cleveland 13, Ohio. USS and American are registered trademarks

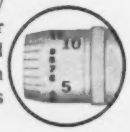
**American Steel and Wire Division of United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal and Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, New York, Distributors Abroad

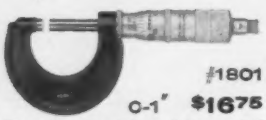
Here are the finest American made micrometers on the market—overall accuracy within .000050—and as much as $3 less than other makes.



The tool steel ground and lapped thread is hardened throughout to 64 Rockwell C to insure longer life and greater accuracy. A hand adjustable take-up nut engages 11 to 13 threads thereby practically eliminating the need for wear adjustment. Thimble lines are elongated and accurately graduated so that line width is held within .006″ to .007″ for accurate reading. Every ST mike has a serially numbered certification of accuracy.

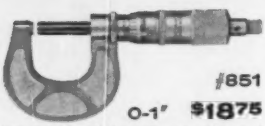


# 1″ ST MICROMETERS



#1801
0-1″ $16.75

Drop forged solid steel frame—⅛″ anvil length—Lustro-Chromed head—has locknut, ratchet and 1/10,000″ vernier—0″ to 6″ models available.

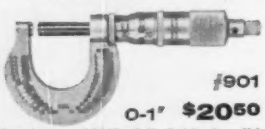


#851
0-1″ $18.75

Rib-reinforced drop forged solid steel frame—anvil will enter 12/64″ slot—has locknut, ratchet and 1/10,000″ vernier—0″ to 6″ models available.

#T-1
0-1″ $20.00

Light-weight, vacuum sealed tubular frame minimizes hand heat distortion—black wrinkle finish—has locknut and ratchet—reads to 1/1,000″—0″ to 96″ available. 1/10,000″ vernier available.



#901
0-1″ $20.50

Reads to .0001″—full finished solid frame—Lustro-Chromed frame and head—has locknut, ratchet and 1/10,000″ vernier—2″ model also available.

Write to us for new S-T Catalog 25 **"Precision Measuring Tools and Instruments"** and the name of your nearest stocking dealer.

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**320 Armstrong Ave., St. James, Minn.**

**BRANCH OFFICES: New York 12, N.Y., Chicago 44, Ill., Los Angeles 19, Cal.**

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# Miniature

**BORING TOOL BLANKS FOR PRECISION CAVITY OPERATIONS**

Full range of sizes from 00 to 10, now available as "standards" from Woodruff & Stokes. All are finish ground and hardened all over.

- **Super Alloy HSS**
- **Shanks are finish ground to .2495 dia. for recessing or automatic screw machine holders**
- **Precise concentricity is maintained between head and shank**

**SPECIFICATIONS — SERIES RT2002**

| Size | Neck Length | Overall Length | Head Dia. | Land Width | Neck Dia. |
|---|---|---|---|---|---|
| 00 | .125 | 1¼ | .040 | .008 | .020 |
| 0 | .156 | 1¼ | .048 | .010 | .030 |
| 1 | .187 | 1¼ | .057 | .012 | .035 |
| 2 | .250 | 1¼ | .069 | .014 | .044 |
| 3 | .250 | 1½ | .081 | .015 | .050 |
| 4 | .312 | 1½ | .089 | .016 | .055 |
| 5 | .312 | 1½ | .099 | .017 | .065 |
| 6 | .312 | 1½ | .107 | .018 | .065 |
| 8 | .375 | 1½ | .132 | .019 | .090 |
| 10 | .375 | 1½ | .151 | .020 | .095 |

Also available as standards are screw machine tool blanks, RT2001, with ground shanks only. Remaining portion of tool is approximately .008 greater than dimensions shown. RT2003 fluted and relieved right or left hand cutting.

Write today and get the full story on W&S Miniature Boring Tool Blanks and other small precision cutting tools.

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INCORPORATED
Bldg. 32, 349 Lincoln St., Hingham, Massachusetts

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## How to estimate DIES, JIGS, and FIXTURES

How long will it take—how much will it cost—to build a die, jig or fixture for a job?

An accurate estimate can be made in a matter of minutes.

All that's needed is a part print, the tables in this Special Report and some knowledge of tool construction.

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## OFFERS "GUARANTEED" MDNA MEMBER MACHINE TOOLS—

RBG = Rebuilt Condition Guaranteed
RCG = Reconditioned — Guaranteed
*Indicates 1940+ Model **Indicates 1950+

**AUTOMATICS—CHUCKERS**
*9"16"—6 spdl Acme RA6 w/Thrdg & Tooling
*1¼"—6 spdl Acme RA6 w/Thrdg & Tooling
**1AC W&S Autom Chucker 1950's
**2AC Warn Swa Aut Chuck S/N 1,643,456 (1957)
**3½"—6 Spdl RB—Acme w/H.S. Drlg & Threadg
**1605 Gorton Swiss ½" cap, Bar feed, 3 Spdl Attch
**0G BS ⅝" cap, V Slide, Slot, 2" Turng Cap (1952)

**BOREMATICS**
**221 & 321 Heald Sgl. End. 2 Spdl Excellent
*1212A Excello Dbl End, 4 Spdl 1943 RCG
**281—Stokerunit Dbl End, 8" Dia, 15" T. Trav.
*Baker 2 way Horiz Hydr 2"-78" Spdl Adj. Cycle attch
**3U Stokerunit Dbl. End Dbl. Spdl. #DH-4 Heads
**421 Heald, Sgl End, Hydr 32" Swing 1950's
**#322 Heald D.E.D. Spdl (1955)
**#422 Heald D End Dbl Spdl (1955)

**BORING MILLS**
36" King VBM complete
*36" Bullard VTL, Side Head
**42" G&L VTL, Side Head 320 RPM, 50 HP
*52" King VTL Side Head Clean
*74" Bullard "Cutmaster" VTL Excel. Like Rblt.
*4 Sellers Horiz. Tbl. Type (1942)
*3" Universal Horiz. Tbl. Type (1941)
*5"—5ii Sellers Floor Type—Nice Cond.

**BRAKES**
**16'—250 Ton Series #130, Flange Bd 36"x20' (1950's)

**BROACH**
**6 ton—54" Colonial Hydr Ser 13094, Excel.
**15-90 LaPoint Vert. Surf. Mod SRV.

**DRILLS**
*1R Bakewell Radial Arm Drill 1 HP
**22" Allen Box Col. 1 HP 6" Spdl. Feed
*25" No. 282 Barnes 4 MT, Air feed 3 HP
*28" Avey 2BMA6 w/Deep Hole Attch.
*28" Colburn No. 4 MT. 3" cap. 10 HP

**DRILLS, MULTIPLE SPDL.**
*3 Spdl. Lee-Giff 5 Spdl. Base 3600 RPM 2 HP
*4 Spdl. Lee-Giff #2 MT 3600 RPM 1 HP
**16 Spdl Fox E-60-H, Adj. Spdl, Hydr feed (1951)
**24 Spdl. H-6 Nateo Hydr Table ¾" U.J. (1950's)
**36 Spdl. C5B Nateo 2½" U.J. 28 x 54 Head

**DRILLS, RADIAL**
*3' x 11" Carleton Univ Box Table
*4' x 11" Amer. "Hole Wizard" RBG
*5'x15" Cine Bickford RCG

**GEAR MACHINERY**
**#53-2 Vinco Gear Checker Involute
*#13 Gleason Hypoid Cutter Sharpener
*#860B Mich. Gear Finisher, Microflex Counter
*100" Newark cutter 24" face cap 10 HP RCG
**#106 Gleason Gear Generator s/n 32036
*15" Gleason Spir. Bev. Cutter Grinder
*#00 & #1 Hamilton Hobbers
*Type A Barber Coleman Hobbers (1 long bed)
**65A3 Fellows Shaper w/access
*Type 6 Fellows #61 Shaper 35" OD Cap 1950

**GRINDERS, MISC.**
**Wendt Sonis Econogrind #1A195
**Blake Flute Grinder to ⅝" Cap
*4 x 12 Landis Ext. w/Plunge (2)
*6 x 18 Landis Ext. w/Plunge #24473
*12 x 36 Cinc. Univ. w/Int. Spdl. RBG
**10x24 No. 4BG1 Van Norman 15° Head '55
**30x48 Landis CHW Univ Like New 1952
*#2 Cinc. Centerless, Profile Dresser RBG
*16 x 36 Landis Cyl. w/5° Head
**Wickman Microform (optical) Like New
**180 Sheffield, Multiform (1957) Like New

**GRINDERS, INT.**
**1109 Bryant Internal 6" Str. 9. swing Excel
**1316R Bryant Hole Face & Int. 28 Spdl (1952)
*109 Bryant Int. New Spdl. (1947) RBG
*72A3 Heald TR Mod. & Sizematic Mod.
*16-16 Bryant Chucking 1600 RPM
**#172 Heald 36" Swg. 36" Str. '43 & '50

**GRINDERS, SURFACE**
**8 x 24 Brown & Sharpe Hydr S/N 654 Excel
*12 x 36 Mattison, Hydr. Dresser
*12 x 36 G & L Hydr. Crush Grind Attch. 15 HP
*16"—#11 Blanchard Vert Rotary RBG
**#240—30" Besley Dbl. Opposed w/Ferris wheel

**INSPECTION EQUIP.**
K&E Trammel Insp Equip—½ Price—Like New
*BL2416 P&W 3 Spdl, Profile Tracer

**LAPPERS**
*26F Norton Hydro, Vert., 26" Cap. 10 HP

**LATHES**
*12 x 54" Monarch T. R. Mod w/access.
**15 x 54 LeBlond Dual Drive w/access.
*18 x 110 L & S w/TA. Chucks etc.
*30" x 48" Monarch Mod CM, Ser. #16526
*20 x 120 Springfield Tool'g. 10 HP RCG
*24 x 96 LeBlond H.D., T. Att. Chuck (1942)
*30 x 96 Niles "Timesaver" T.A. 3J, 4J RBG
*22 x 126 L & S w/Chuck, SR etc.
*30 x 84 American 18" Air Chuck Coolnt.
*40 x 68" LeBlond H.D. Dual Contr. 40 HP
*45x80" Sidney (raised) 360 RPM, 2 carriages (1949)

**LATHES, TURRET**
**#3 Gisholt, Barfeed, 1952, Excel.
**#3 W&S w/Hydr. Barfeed & Tool'g RCG
*#4 Gisholt Univ. H Ways 2½" Cap
*#4 W&S Presselector, Air Chucker (1942)
**#5 Gisholt Univ. H. Ways 3" Hole
*#5 W&S w/Barfeed, Pressel RBG
**#5 Gisholt Univ w/Chucking (1950's) RCG
*1A W&S Saddle Type 900 RPM
*2A W & S Saddle Type 3½" Cap B, Feed
**3A W&S with Access. 1952 & 1945
*4AL Gisholt Saddle Type, 9¼ Hole, 30 HP

**LATHES, PRODUCTION**
**Gisholt Simplematic Autom 20", Reatten Table.
**17 x 76 Seneca Falls "Le Swing" 50 HP.

**LATHES, TRACER**
*30H Bullard 3 Spdl. Man-Au-Trol #28104
**60" Monarch "T" w/generator (1952)
*36x36" Monarch H.D. w/Keller Tracer

**MILLS**
**BB2V Hardinge H.S. Proc. 5000 RPM ¾ HP
*3K K&T Horiz. Ser. RBG
*4K—K&T Horiz., 18x42 Tbl. Trvl. 15 HP
**#4 K&T Univ Horiz 15x74 Tbl. 10 HP RBG
**#4 Cinc H.S. D.T. Vert Mill (1951)
**#4 Cinc H.S. DT., 18x80 Tbl, 15 HP (1951)
**6CK—W&S Harig w/Vert Head Excel.
**2-24 Cinc Autom #50 MT Autom Quill Rter.
*56x96 Cinc. Hydrom., Simplex RCG
*36x36x146" Ingersoll Planer, 4 Heads
**Beam Mill, Onsrud—Tracer Controls 24'x9' table ('58)

**MULT-AU-MATICS**
**12"—12 Spdl Bullard Type K S/N29340
*16"—8 Spdl. Bullard Type D RCG

**PRESS**
**45 Ton Clearing OBI 4" Str 18x30 Bed
**75 Ton 9F Cleveland SS Trim'g Attch 5" Str.
**75 Ton Watson Stillman Hydr 20" Str.
**80 Ton #7 Federal OBI 7 & 12" Str.
**135 Ton A5 Niagara OBI 8" Str. Cushion
**400 Ton Ferracute E401, Knuckye Joint
400 Ton Cleveland Toggle Model 90T96 RBG

**ROLLS**
12" x 1" NBP Pyramid, Drop End, Older, Good

**SAWS**
*16" ML16 Doall Vert Band w/welder
**20" DoAll "Contourmatic" V. Band Hydr.

**SHEAR**
**16'x10 ga Cinc, 2 sets Blades, Mier B. Gage (1950's)

**WELDERS**
**50 KVA Taylor Winfield Press Type Univ. Spot
**75 KVA Sciaky Spot 3 phase w/Controls
**75 KVA National Circular 18" Thr 440 V
**100 KVA Thompson No. LS3, Longitudinal
**Welding Positioners 10 to choose from

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## HEAT TREAT

**Harden Quench & Draw Line, 3500#** per hr. capacity. Manufacturer R & S Furnace Co. **New, never used, disassembled.**

**Hardening Furnace** 5' wide x 24' long x 2' working height, with cast link belt of 35-15 alloy.

**Quench Tank** 16' with 4' apron conveyor.

**Draw Furnace** 5' wide x 38' long x 2' working height with cast link belt of 25-20 alloy. Two zone recirculating type.

Temperature controls, drives, reducers, structural steel. Replacement cost approximately $140,000.00.

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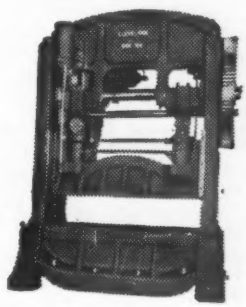
## 200 TON BLISS #7D STRAIGHT SIDE Double Crank PRESS

**— TIE ROD CONSTRUCTION —**

- 30" Shut Height
- 12" Stroke
- Rolling Key Clutch
- Motor Driven—Complete with Motor
- Push Button Controls
- 38"x72" Bed
- Back Geared
- Air Cushion



**Must Move Immediately SPECIAL..... $7,950**

**#A3 NIAGARA O.B.I. Presses (2), 1948**
**#71 CLEVELAND Back Geared, 25" Shut Height, 6" Stroke.**

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#7 Kling Univ. Ironworker 6"x6"x⅛" cap. New 1954
#2½ and 3 Kling Friction Saws Late
#2L Gisholt Masterline 1948
#2½ and 3 Kling Friction Saws Late
⅜" Kane & Roach Shape Straightener
27"x22' c Niles Lathe, Late
14"x36" Mattison Hyd. Surface Grinder
20"x120" Monarch Model CM

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MORTON Universal Combination, Boring, Drilling, Milling Machine and Draw Cut Planer. 13'x46', 10¾" Spindle.

INGERSOLL 12'x46' Universal Traveling Housing Type Boring & Milling Machine.

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8" Bar GIDDINGS & LEWIS, late type, Timken bearings throughout, a big beautiful tool, cost new—$300,000; quick sale price $45,000, will finance, weight 260,000lb.

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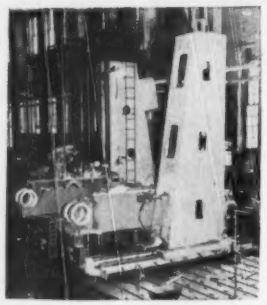

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DEEP HOLE DRILLING & BORING MACHINES

MONA MEMBER

In stock, Excello, Natco, Fox, Barnes and Heald, Platen, way & table type.

LEE STEVENS MACHINERY

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Used Power Press Brake with 10—or 12 ft. bed for bending 14 guage galvanized steel

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POSITION VACANT

Wanted by a prominent manufacturer—a Machine Shop Superintendent with experience as an administrator of a multishop operation involved in heavy machining. P-7962, American Machinist, Classified Adv. Div., PO Box 12, New York 36, N. Y.

3B Pratt & Whitney Jig Borer, 1943. Used 100 hours, like new condition ..... $13,500
25 G'shelt Turret Lathe B.F. '44
No. 3 Plan-O-Mill Form & Thread Mill '47
8"x16" Hanson & Whitney Univ Thread Mill. '43
No. 1½ Barnes Vert. Hyd Hone Dia. 2" Str. 7" Auto Str. Cycle, w/microdex timer. '43
20 Brown & Sharpe Hand Screw Bar Feed

*Machinery Since 1919*
EDWARD FRANKLIN SCHILL
59 EDISON PL. NEWARK 2, N. J.

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EASTERN

Rebuilt Machine Tools
THE SIGN OF QUALITY
THE MARK OF DEPENDABILITY

96"x20' centers Betts Bridgeford Engine Lathe, extra heavy duty, very clean.

No. 5 Warner and Swasey and Jones and Lamson Ram Type Turret Lathes, late, clean.

16x38x72" LeBlond Gap Lathe, Timken Bearing, already reconditioned.

16-20"x54" centers Lodge and Shipley Lathe, late.

16" Cincinnati Universal Shaper, with vise, extras.

115U Moline Multiple Spindle Drill Press, 30" dia. round head, hydraulic feeds, 16 spindes No. 4 M.T. late.

No. 3 and Type A Barber Colman Gear Hobbers, reasonable.

30"x30"x8' Gray Planer, 4 heads, variable voltage, 1949.

4K, 5CK, 5HM Kearney and Trecker Plain Millers, late, clean.

50"x41' centers and 60' centers LeBlond Lathes, two carriages.

48-53" Niles Car Wheel Borer, latest model. 24"x72" centers Landis Type F Grinder, 1953, latest, pract. new

THE EASTERN MACHINERY CO.
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1-1241 CABLE ADDRESS EMCO

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TOOL ENGINEERS

ELECTRIC TYPEWRITER DIVISION

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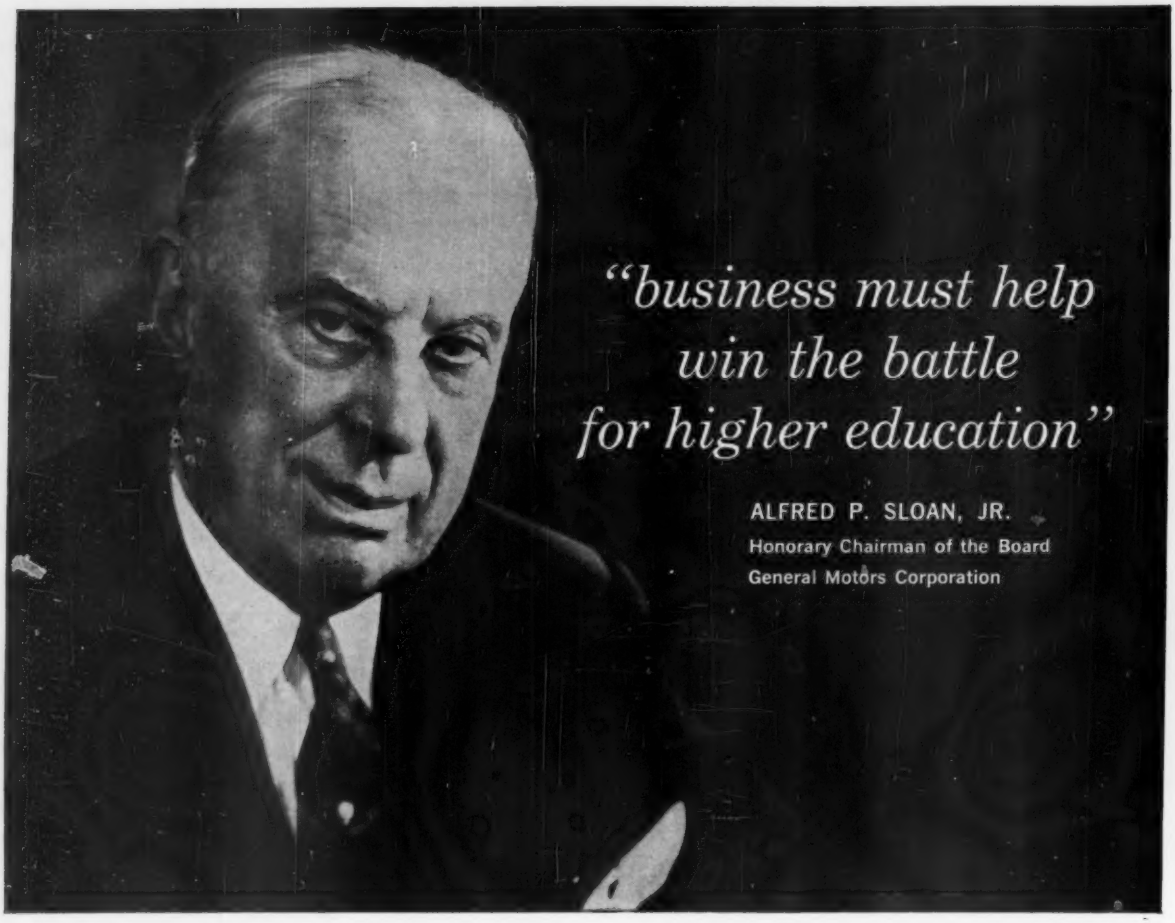
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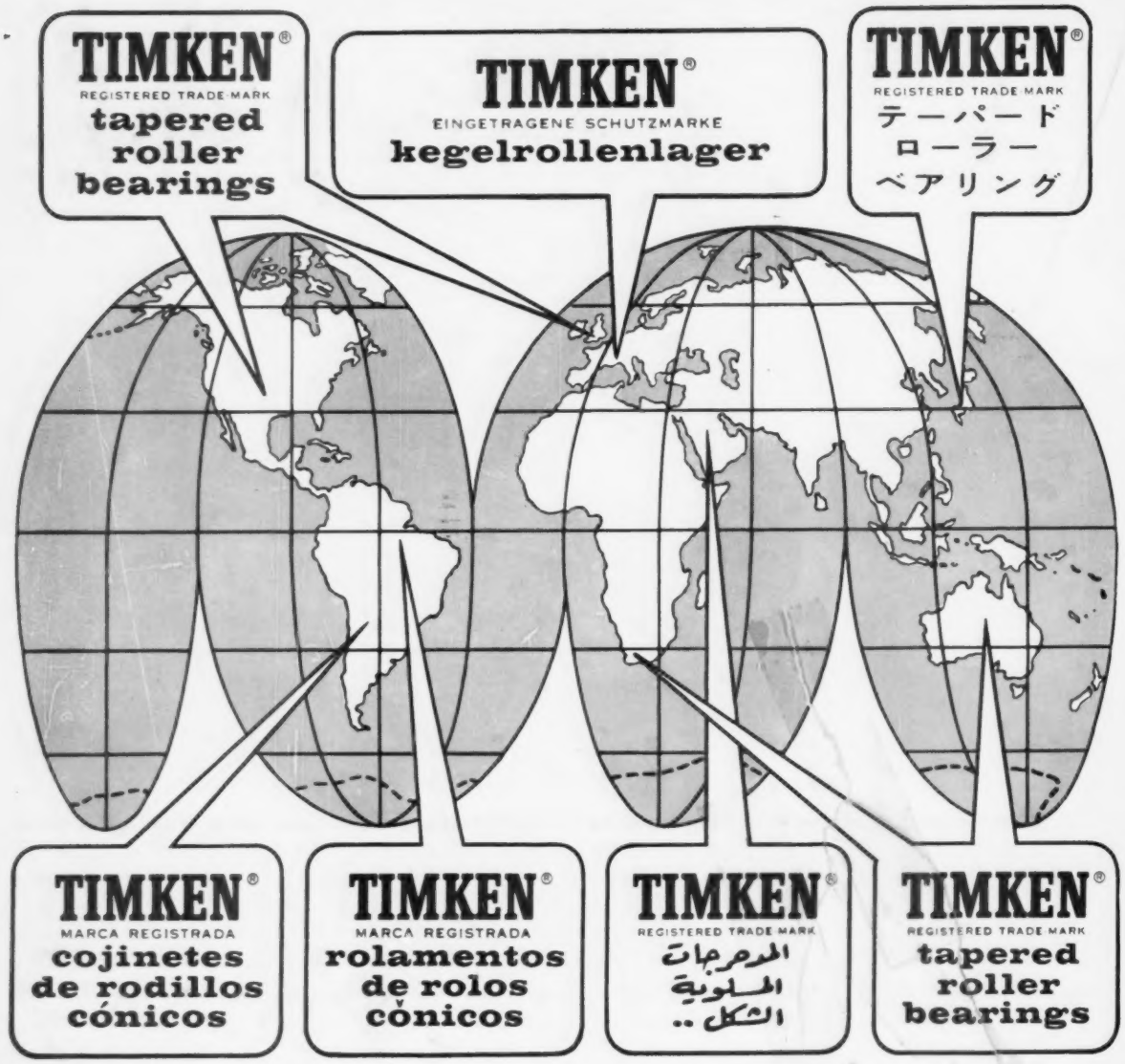


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